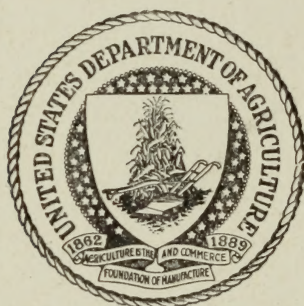


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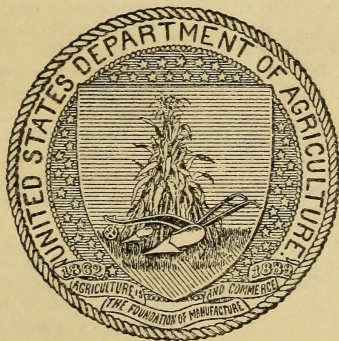
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VOLUME XXXII

JANUARY-JUNE, 1915



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EXPERIMENT STATION RECORD.

VOL. XXXII.

JANUARY, 1915.

No. 1.

The annual convention of the agricultural colleges and experiment stations is always an event of national importance, for it concerns the welfare of a system of public-service institutions representing every State, and bearing an unusually close relation to the people. But the convention of 1914 was of uncommon significance, marking as it did the beginning of a great new phase of their work, which for the time being naturally occupied the center of the stage. It was essentially an extension convention, considering not only the scope, purpose, and methods of that division of activity, but its relationships to the other agricultural work and other agencies.

The new extension work has brought with it, not only an enlarged field of operation but many incidental changes and adjustments, which make its effect far-reaching. While it is a type of teaching, it involves new methods and new relationships, and hence it concerns the college organization as a whole, its attitude, and its outside connections and influence. The people are its pupils, and the benefit to them will be proportional to the extent to which they are led to enter into the new enterprise.

Another new or closer relation developing out of this latest expansion is that with the Federal Department of Agriculture, which was a matter of comment at the meeting. Thus, the Secretary of Agriculture in his address before the convention spoke of the increasing realization of the unity of interests of the Department and the agricultural colleges, the widened opportunities for cooperative service, and the additional responsibilities incurred. And the president of the association in referring to the matter said: "The chief importance of the new policy of the Department of Agriculture in its relations with these colleges is the recognition that this national institution, founded also in 1862 primarily for research and instruction in agriculture, is really a part of our national system of agricultural education, represented in the States by the land-grant colleges, and that therefore it should work not alongside of them but in close interlocking alliance with them."

These things all contributed new lines of interest to the Washington meeting, and served to give it unusual importance. The dis-

cussion of administrative questions relating to the new work, its opportunities, its responsibilities, and its affiliations naturally found a place in the various other meetings. This began with a three-days' meeting of the committee on extension organization and policy, held prior to the opening of the convention, which was most helpful in enabling thorough consideration and conference on many fundamental questions arising from the new enterprise. This conference was attended by the chairman of the executive committee and the president of the association, and as the deliberations necessarily concerned the Department of Agriculture, which is cooperating so intimately in the enterprise, several of its officers connected with the work were brought into the meetings. The whole effort was to arrive at a proper point of view with respect to certain principles of general application, realizing that adaptations would need to be made to local conditions and requirements.

The desirability of thorough study at the outset arises from the novelty of the undertaking in its present scope, the limited experience had in such effort, and the fact that great confusion has arisen as to the aims and purposes of the movement. No such undertaking of a national scope and such ultimate dimensions has ever been sanctioned by a people; and with little time for preparation it has been assigned to the colleges to give it form and effect. The lines are being laid for a permanent enterprise, which is to constitute a great national system. The true significance of the movement is not yet grasped by the great body of the people, and probably not fully by some of those entering into it. As Dr. True stated, "the agricultural college is to be changed from an institution having a strictly local habitat, with comparatively limited powers for the diffusion of knowledge, to a widely diffused institution dealing educationally with multitudes of people at their own homes. And it is to carry with it wherever it goes the National Department of Agriculture, not only as a provider of funds, but as an active coadjutor in its educational operations." This involves more than the appointment of additional officers and specialists, and machinery to secure the economical expenditure of the new public funds. It requires that the extension work be made a vital part of the organism of the college and the Department, if the ends reasonably expected are attained; and it calls for a sympathetic and helpful spirit between the various classes of workers, with due appreciation of the work of each and loyalty to the enterprise as a whole.

A visible product of the conference was a report of the committee on extension organization and policy, consisting largely of descriptions and definitions of terms applying to extension work; but in fact it went far deeper than this in the crystallizing of ideas as to

the essentials of organization and procedure, and in bringing to light some of the problems for future consideration. This committee has a highly important field from now on, and the kind of study which it should be able to give will be most profitable in perfecting the system for extension operations.

Another conference, broader in representation because it included the directors of extension in the several States, was held immediately after the close of the convention, and was called at the suggestion of the Director of this Office. It dealt particularly with certain requirements growing out of the law, about which there had been considerable uncertainty, but it took up also the cooperative relations with the Department under its own funds, and brought about a fuller understanding as to other features.

Frequent conferences of this sort, or devoted to special features of the work, will be found highly profitable in securing a broad view of the situation and in working out the best means of accomplishing the desired results. Not that it will be feasible or wise to standardize methods or conceptions, or to make rigid rules to apply to all the varied conditions afforded by this broad country. But rather that there may be opportunity for the interchange of opinion and experience, and especially for the kind of study which committees of the association have in the past given to various matters relating to college instruction. After determining what is contemplated by the law and what specifically is excluded, the vital question is as to what it is wise and most profitable to do, and what means are most effective in attaining the results. For the extension movement must be first of all an organized effort, and it must have an orderly plan or program. It affords the greatest opportunity ever presented in our college work for errors in judgment or faults due to improper organization, which would reflect upon the colleges and upon the success of the work as a whole.

It is no longer a propaganda, as some have seemed to conceive it, or essentially a publicity agency for the scattering of facts and information broadcast. It has a more serious purpose, and seeks a more permanent and farreaching end. Ultimately it is to develop the people themselves and their initiative for the improvement of conditions surrounding them, as well as to teach definite facts and practices. As has been said, the people need more than pieces of information. They need stimulation and guidance; they need to be made themselves a vital part of the movement, and to be encouraged to organize to receive the help.

In other words, the problem of extension is, as President Wheeler of California expressed it, a human problem. The human element enters into both the imparting and the receiving of the information.

This is true of all education, and is coming to be realized especially by the extension workers themselves. It is being learned that extension teaching in agriculture carries with it unusual responsibilities, since it deals with matters which are of vital and immediate importance to the farmer and his family, affecting their income, daily life, and community interests.

On the other hand is the necessity for taking account of the special knowledge of conditions often possessed by the farmer himself, in connection with the introduction of modified practice. All this points to a restatement of the principle that "how to apply the results of experiments to his own conditions will ever remain the problem of the individual farmer." It indicates that the mission of the county agent or other extension worker is to be fulfilled less by hard and fast prescriptions than by suggestion and cooperation.

The working out of the new relationships and adjustments arising out of the development of extension formed a theme of discussion, not only within the association itself but in various other bodies which met at that time, notably the American Association of Farmers' Institute Workers, the Society for the Promotion of Agricultural Science, and the American Farm Management Association.

Extension work of various kinds had begun to attract the attention of a considerable number of agencies outside the agricultural colleges before the Smith-Lever Act was passed. These have often worked independently and on a separate plan. One problem has been and still is to relate these various activities to the common purpose, and give them direction. A great step has been made in the provision to unite through cooperation all the extension work of the Department of Agriculture and that of the colleges, centering it in the extension departments of the agricultural colleges. This has already been followed by the union or cooperation with the colleges of other agencies engaged in extension work in the States.

As regards the farmers' institutes, the importance of whose work as a propaganda for arousing interest in measures for the improvement of agriculture and country life is thoroughly appreciated, it was made plain during the meetings that where the institutes are directly connected with the colleges they can be easily modified in most cases so as to fit them into the extension system. With the development of the county-agent system, supplemented by the employment of specialists at the colleges, it may ultimately become a question as to how far it will need to be supplemented by the institutes or similar agencies, but for the present the aim will evidently be one of cooperation with all the agricultural, commercial, social,

religious, and educational forces available, and their proper coordination and federation.

These new activities will undoubtedly modify present methods in many respects, and increase the duties and responsibilities of the colleges and stations and of the Department. The latter are to furnish the great body of highly trained men and the sound teaching and research upon which extension work must depend to be effective. To do this successfully they must differentiate their activities, direct attention to advanced teaching for the special preparation of workers, and carefully husband the research facilities.

One of the earliest effects upon the colleges seems likely to be in a demand for the better training of extension workers. With the rapid organization of so large a field force and the existing shortage of material, defective preparation will be brought to light in many instances, while the most successful of these workers will the soonest appreciate their limitations. The colleges, already overburdened though they are, must prepare to meet this demand. Thorough and adequate courses of study must be provided for those who are to become extension workers as well as teachers, investigators, and the like, even though these necessitate the abandonment of some of the work already undertaken in the subcollegiate grades of agricultural teaching. Many things which are now being attempted must be relegated to the secondary schools and others to the extension divisions. One broad effect of the new developments, as brought out in the address of the president of the association, should therefore be a clearer differentiation of the field of collegiate instruction.

The new extension activities will also require sharper differentiation from those of the experiment stations, and vice versa. As the committee on experiment station organization and policy set forth, "the extension work has developed very largely with and out of the work of experiment stations; and in a considerable number of cases has formed a feature of the stations' own activities. This fact has tended to broaden the conception of the station's field and popular expectation in regard to it. Instead of being strictly an institution for acquiring information through investigation and experiment, it has served to some extent for the popular dissemination of information regarding improved farm practice. The effect of this has been to confuse the public mind, and often many workers within the stations, as to the real function of the experiment station."

The committee held that broadly speaking, the activities of the experiment station should be directed to the gaining of knowledge of definite character, and the determination of facts and methods for agriculture. Its methods should be those of investigation and experiment, scientifically sound and capable of giving results which may

be safely interpreted. It was recognized that the station can not confine itself to the laboratory or experimental field or stable, but must often go out into the State to test the validity of its deductions and their practical value or application. "But when the facts established by the station have been sufficiently tested by it to make certain their general truth and application, the matter should be regarded as having passed out of the strictly experimental field."

In detail, however, it is not always easy to draw the dividing line, and the station work and the extension work may run together to an extent that requires the exercise of good judgment. For example, it was shown that the results of station work or commonly accepted facts can rarely be demonstrated or extended with certainty and safety in a new locality without trying them out, to some extent. In a sense, every field demonstration involves some element of doubt, which makes it a test for that locality. While the extension force will presumably not undertake experiments for the acquiring of general information, the widespread attempt to put into practice on a detailed scale the teachings of the stations will often involve local field trials or tests to make the field force sure of their ground, and give strength to their judgment in planning a demonstration campaign.

On the other hand, the results of investigation often need to be tested under a variety of conditions to determine their general truth, necessity for modification, and their practical value. Thus far, the work still is in the experimental stage and therefore in the field of the station. But "the station can not extend its local tests indefinitely, despite the fact that nearly every new locality would represent some new local conditions of soil, climate, economic situation, etc. The station must be content to rest its efforts when it has determined the general truth of the results and their place in practice."

The establishment of these lines of demarcation should relieve the stations of a part of the burden they have been carrying. This is well, for the more rigorous practical tests to which existing knowledge will be subjected will disclose its limitations and suggest further studies. They will need, therefore, their full resources to meet the increased demands upon them for constructive investigation and experiment.

This necessity of keeping the work of the experiment station well to the fore, and developing it with the growth of the extension work rather than allowing it to fall behind, was strongly emphasized at the convention. There has been a fear in the minds of some that the rapid expansion of extension work, with its great popularity and its close contact with the people, would tend to produce a feeling of sufficiency and to break down the support for thorough investiga-

tion. Without doubt, there is danger of this and of its effect on local appropriations. A great deal depends upon the proper attitude of those directly engaged in the outside work and those in charge of the policy of the institution.

This danger was voiced in the address of the president of the association. A great popular movement like the present is, he said, "likely to have a torrential influence, and sweep men off their feet and even institutions off their foundations. But such floods are short-lived. After they subside it is often possible to accomplish greater things than were feasible before they came." This will be helped on by the discovery of the limitations in our agricultural knowledge and the material suited for extension teaching. It will speedily be found that the extension service can not straightway accomplish all that its enthusiastic propagandists have prophesied for it. Very soon it will become clear that "to many of the agricultural problems which the extension men will encounter in their work among farmers no solution, or at best a very imperfect solution, is now available. . . .

"The more the extension workers, and to a considerable extent the agricultural people with whom they work, come to realize that our present knowledge will only go a little way toward solving the multitudinous problems of agriculture, the more widespread and insistent will be the demand for more numerous and thorough investigation of these problems. It is therefore very important that we should consider the actual status of our research institutions, and while rejoicing in their many good features and their valuable work, should be active in remedying their deficiencies and enlarging their services."

Research will remain, not merely an incidental function of the agricultural colleges, but fundamental and essential to their success in teaching and extension work. These facts, together with the public funds appropriated specifically for the purpose, place the colleges, as was stated, "under the greatest obligations to create within themselves the atmosphere and the conditions most favorable to successful research, and to make sure that their research workers can give undivided attention to their investigations."

Only by making insistently felt in the institutions the gentle and highly intellectual forces needed to inspire real research, can this feature be made so efficient that its results will furnish an adequate foundation for the administrative and educational functions of these institutions, and for the permanent advancement of our great agricultural interests.

CONVENTION OF ASSOCIATION OF AMERICAN AGRICULTURAL COLLEGES AND EXPERIMENT STATIONS, 1914.

The twenty-eighth annual convention of the Association of American Agricultural Colleges and Experiment Stations was held at Washington, D. C., November 11-13, 1914. It was accompanied as usual by meetings of about half a score of related organizations, as follows: American Association of Farmers' Institute Workers, November 9-11; American Farm Management Association, November 9, 10; American Society of Agronomy, November 9, 10; National Association of State Universities, November 9, 10; American Association for the Advancement of Agricultural Teaching, November 10; Society for the Promotion of Agricultural Science, November 10; American Society of Animal Production, November 10, 11; Land-grant Engineering Association, November 11-13; Association of Official Seed Analysts, November 12, 13; Association of Feed Control Officials of the United States, November 13, 14; Association of Official Agricultural Chemists, November 16-18; and American Society of Milling and Baking Technology, November 18. Collectively these meetings brought together college presidents, experiment station and extension directors, and workers in many fields of agricultural science to the number of approximately five hundred.

At the opening session an address of greeting was made by the Secretary of Agriculture, in which he stated that all the States had accepted the Smith-Lever Act and that nearly all were already cooperating with the Department under its provisions. He commended the increasing realization of the unity of interests of the Department and the agricultural colleges, and believed that this would broaden appreciably their opportunities for service, as well as their responsibilities. The difficulty of securing trained men to take up such new undertakings as the extension work, the marketing studies of the Department, and the administration of the new Cotton Futures Act, was pointed out, and the colleges were vigorously urged to develop strong courses in rural economics and related subjects, and to assume a general position of leadership in country-life affairs.

The report of the executive committee dealt largely with the two principal events of the year, the passage of the Smith-Lever Act and the holding of the sixth session of the Graduate School of Agriculture. At a subsequent session, set aside for the discussion of problems in connection with the administration of the Smith-Lever Act, President Thompson reviewed the passage of the measure and Dr. A. C. True, of the States' Relations Committee of this Department, described its practical workings thus far. A chart showing in graphic form the basis of organization was on exhibition and is to be published for general distribution.

Doctor True drew attention to the recent ruling of the Solicitor of the Department, that funds contributed by the States, counties, or other agencies for extension purposes are, when an offset to the federal funds, subject to the same requirements as those derived under the Smith-Lever Act. Such funds, if not an offset, are under the control of the colleges except where a

general cooperative agreement has been entered into with the Department. He emphasized as an important need at this time the provision by the colleges of strong administrative heads for their extension work. The holding of national and regional conferences on extension business was also advocated, and a conference of the extension directors in attendance with the States' Relations Committee followed the close of the convention.

Dean C. F. Curtiss of Iowa, President A. M. Soule of Georgia, A. D. Wilson of Minnesota, and President Benjamin Ide Wheeler of California participated in the ensuing discussion.

The report of the bibliographer, also presented by Doctor True, dealt especially with the form of extension publications. He drew attention to the prevailing great diversity among these publications, and suggested some changes in the interests of uniformity, simplicity, increased availability, and ease of preservation. A collection of samples illustrating these points was on exhibition, and announcement was made that the work of assembling as complete a library of extension publications as possible is now under way in this Office.

For the committee on instruction in agriculture, Doctor True reported on farm practice requirements as a part of the 4-year college course, on the basis of an inquiry sent out and visits to many institutions. It was found that at the present time collegiate farm practice is quite generally insisted upon as a feature of the instruction in every branch of agriculture, but it has by no means reached its optimum development—in connection with some courses there is too little practice, with others too much. In the main there is a feeling that there is too little practice for effective teaching. This in many cases is due to lack of suitable facilities at the college for giving the desired practice, and in others to a failure to utilize fully the available facilities. Vacation practice, the employment of students on approved farms for a year or more or in charge of farm practice projects for definite stated periods, and educational excursions are among the means sometimes followed. It was pointed out that the absence of provision for such practice decreases the effectiveness of instruction in agriculture, and that students who are permitted to graduate without it often bring upon the colleges merited unfavorable criticism. The report is to be printed as a separate at an early date.

Dr. H. P. Armsby, of Pennsylvania, reported for the committee on graduate study, dealing especially with the Sixth Graduate School of Agriculture successfully held at the University of Missouri, June 29 to July 24 (E. S. R., 31, p. 301). A policy of concentration upon a few subjects at the school was favored, as well as the provision of some form of credit for work accomplished. It was recommended that greater attention be given by the colleges and stations to ways for facilitating the attendance of the younger members of their staffs at this school.

The report of the committee on college organization and policy, submitted by President K. L. Butterfield of Massachusetts, included a description by President R. A. Pearson of a plan for student and faculty cooperation being tried at the Iowa State College, in such matters as the upkeep of the grounds, sanitation and other minor improvements, and the protection of property. The committee also summarized a questionnaire, conducted by President W. M. Riggs of South Carolina, as to student character records, which indicated a general belief in the desirability of such records but little uniformity as to methods.

The committee on experiment station organization and policy, Dean E. Davenport, of Illinois, chairman, emphasized the need for a sharp differentiation of the field of the station work from that of extension agencies, as explained elsewhere (see p. 5). The committee also discussed the publi-

cation of results, stating as a duty of the station investigator to publish results as promptly as his conclusions will justify, and to keep his records in such shape that the work may be taken up by others. The wider utilization of the *Journal of Agricultural Research* by the stations was also advocated.

The report of the committee on extension organization and policy consisted in part of descriptions and definitions of terms commonly used in extension work, following a conference with the States' Relations Committee of this Department, and in part of the usual annual statistical summary as to the status of extension work in the several States.

The joint committee of the association and this Department on projects and correlation, submitted its first report through Dean F. B. Mumford, of Missouri. The committee has examined about 1,300 projects submitted by the state institutions and about 1,000 from the Department of Agriculture with a view to their possible correlation. Dr. K. F. Kellerman, of the Department, for the joint committee on publication of research, explained the organization and policies of the *Journal of Agricultural Research*, now open to experiment station workers, and urged a wider participation by them.

The address of the president, Dr. A. C. True, dealt largely with the changes necessitated by the passage of the Smith-Lever Act, and the closer cooperative relations established with this Department, these phases being commented upon editorially in this issue (see p. 1). He also pointed out very clearly that under the new conditions the colleges must restrict themselves more rigidly to instruction of real collegiate grade if they are to maintain a permanent position of leadership. The development of strong graduate courses was especially urged upon them, and likewise the maintenance of the proper attitude and atmosphere within the institution with respect to research. Not only is research a necessary part of their work and large sums of public money provided which can be lawfully spent only for this purpose, but it is absolutely fundamental and essential to their success in teaching and extension work. The institutions are therefore under the greatest obligations to create within themselves the atmosphere and conditions favorable to successful research and to make sure that their research workers can give undivided attention to their investigations.

Professor E. L. Morgan, of Massachusetts, described an interesting experiment in rural community planning, inaugurated in a typical New England village by the Massachusetts Agricultural College. It was found that following the adoption of a definite program, a strong community spirit was developed and great improvement effected in agricultural practice and marketing, transportation facilities, and other civic affairs, in education, and in the adoption of an all-year-round plan for community recreation. It is believed that the idea has also possibilities along county and state lines.

Miss Elizabeth Kelley, of Wisconsin, spoke on Home Economics in Extension Work, outlining some of the ways which have been found effective in bringing improved methods into the home. Among these are reaching the farm woman indirectly through her children in boys' and girls' clubs or the schools, or through her husband, or directly in the women's institutes and women's clubs, as well as by demonstrations. The main handicap in this form of extension work has been the scarcity of well-trained women to put into the field, but if these can be obtained great improvements in country life were predicted.

Hon. Carl Vrooman, Assistant Secretary of Agriculture, made a brief address in which he pointed out the need of extension work to make more available the store of agricultural information already accumulated. Following his address the association was received at the White House by President Wilson.

At the final session, a report was given by President Brown Ayres of Tennessee, for the executive committee, on the provisions and status of the Smith-Hughes bill for federal aid to vocational education, including an explanation of the work of the Federal Commission on Vocational Education (E. S. R., 31, p. 401). Commissioner Claxton and others also discussed the scope and details of the bill. The association declared itself in favor of federal aid to vocational education along the general lines of the bill, and instructed the executive committee to cooperate with other agencies in perfecting the measure and aiding in its passage.

Various measures relative to military instruction in the land-grant colleges were referred to the executive committee for consideration. An engineering division was established in the college section, the officers of which are to make provision for either separate or joint programs.

A series of recommendations as to the title pages, pagination, and similar matters in college and station publications was presented from a committee of the agricultural section of the American Library Association. The executive committee reported favorably as to these recommendations, and commended them to the various institutions for their consideration.

The officers elected for the coming year were as follows: As president, President E. A. Bryan, of Washington; vice presidents, President J. H. Worst, of North Dakota, Dean T. F. Hunt, of California, Director C. D. Woods, of Maine, Director P. H. Rolfs, of Florida, and President C. A. Lory, of Colorado; secretary-treasurer, Dean J. L. Hills, of Vermont; bibliographer, Dr. A. C. True, of Washington, D. C.; executive committee, President W. O. Thompson, of Ohio, chairman, President H. J. Waters, of Kansas, President Brown Ayres, of Tennessee, Director W. H. Jordan, of New York, and Dean H. L. Russell, of Wisconsin.

The following were chosen officers of sections: *College section*, President H. J. Waters, of Kansas, chairman, and President W. M. Riggs, of South Carolina, secretary; *station section*, Dean E. A. Burnett, of Nebraska, chairman, Director W. R. Dodson, of Louisiana, secretary, and W. H. Beal, of Washington, D. C., recording secretary; *extension section*, Director R. D. Hetzel, of Oregon, chairman, Director C. R. Titlow, of West Virginia, secretary, and Prof. John Hamilton, of Pennsylvania, recording secretary.

The retiring members of standing committees were all reappointed, and a vacancy in the committee on extension organization and policy filled by the selection of Director W. R. Dodson, of Louisiana. A special committee to consider agricultural terminology was also authorized.

The time and place of the next meeting were left as usual with the executive committee, and since announced for August 11 to 13, at Berkeley, Cal. The proceedings of the association will be published, but, because of the heavy outlay, in condensed form by the use of abstracts of papers and the elimination of oral discussions.

SECTION ON COLLEGE WORK AND ADMINISTRATION.

In the college section, the initial subject was The Relation of the Agricultural College to Instruction in Agriculture and Home Economics in Secondary and Rural Schools, and What the College Can Do to Promote General Rural School Improvement.

President E. T. Fairchild, of New Hampshire, reported on the basis of replies from 30 agricultural colleges that the means most frequently adopted for aiding secondary and elementary instruction were through summer schools for teachers, boys' and girls' clubs, leaflets on agriculture, home economics, and nature study, correspondence courses, and demonstration plants. He suggested that the

agricultural colleges aid in securing the consolidation of scattered rural schools and their more liberal financial support, undertake a propaganda for rural high schools within the States and teachers' training classes in these schools, and favor a law requiring the teaching of agriculture in elementary schools and the training of teachers in the elements of agriculture. President Vincent, of Minnesota, described some of the activities of the Minnesota College of Agriculture, and advocated summer sessions at the colleges and other means for training rural teachers.

President D. H. Hill, of North Carolina, in a paper entitled *Some Changed Attitudes*, called attention to the increasing pressure in technical institutions for the replacement of cultural by utilitarian subjects. He believed there is danger of mental contraction unless this attitude is modified. Inasmuch as the mere training of experts will not make leaders of men, he advocated the retention of some subjects which turn men's minds away from the purely materialistic point of view. "Profound knowledge of a specialty plus power to be reasonably at home in many realms of thought—these after all are the ingredients of forceful manhood. You can not quicken a living spirit with mere information."

He also favored interesting students in the discussion of civic questions, partly as a means of training, since scientific men often must appear before commissions, boards, legislatures, and the like, but also partly because they have a responsibility as educated men. In discussing this paper, President W. O. Thompson, of Ohio, developed the idea of preparation for all sides of life, moral, social, and civic, as well as vocational.

The *Cost of Instruction in Agricultural Colleges and the Relation of Salaries in the Division of Agriculture to those of other Divisions in Agricultural Colleges and Universities*, was discussed by President C. A. Lory, of Colorado. He described and illustrated by means of charts a system of cost keeping based on the units of semester credit, student semester credit, and student recitation hour, as tested at the Colorado College, where the last named was found the most satisfactory. A uniform system of cost keeping was deemed well-nigh essential for comparing statistics from similar institutions.

SECTION ON EXPERIMENT STATION WORK.

Under the topic of *Meat Production as a Factor in the Progress of Agriculture in the United States*, George M. Rommel, of this Department, presented for Dr. A. D. Melvin and himself, a paper on *Meat Production in Argentina and Its Effect on the Industry in the United States*.

Although the Argentine export trade in beef during the last 15 years has grown remarkably, and about 154,000,000 lbs. of beef and meat products were imported into the United States during the year ended with September, 1914, the speakers considered this largely attributable to the decline in the surplus production in this country. At the present time killings are about as great as the supply of breeding animals will warrant, so that American breeders need have little fear of serious competition. On the other hand, Argentina offers a promising market for high-grade breeding stock.

Dean F. B. Mumford, of Missouri, discussed *Meat Production on the High-priced Corn Lands*, showing that the total production of beef, pork, and mutton in this country is falling off despite the rapidly increasing demands, and that this shortage is due primarily to the fact that under present conditions meat production is relatively less profitable than other lines of agriculture, especially grain growing. He concluded that the methods which are likely to result in

decreasing the cost of meat production, and thereby making it possible for the farmers of the corn-belt region to produce meat animals on high-priced land, are to be found in developing unimproved areas of land for grazing purposes; utilizing the by-products of the farm, particularly coarse roughage such as stover, straw, and cheap hay; the general adoption of the silo as a means of preserving corn and other crops; feeding more sheep and hogs because of their well-known efficiency in the utilization of feedstuffs; and lastly, the selection of more efficient meat animals.

The Possibilities and Methods of Meat Production in the South were summarized by D. T. Gray of North Carolina, who stated that the South was producing nearly as much meat 25 years ago as to-day. He believed that the advantages of this region in cheap lands and labor, mild climate and long-growing season, and comparative nearness to markets were still underestimated, and despite the cattle tick and other handicaps that success was to be expected upon adapting the industry closely to southern conditions as to feeds, buildings, etc.

In the ensuing discussion, Dean C. F. Curtiss, of Iowa, deprecated the exporting of cotton-seed meal and the subsequent purchase of fertilizers, and suggested cattle feeding as a remedy. Dean W. M. Jardine, of Kansas, and Director H. A. Morgan, of Tennessee, emphasized the need of more live stock in their respective States, but the latter pointed out that the change was difficult to bring about under a tenant system. Director F. B. Linfield, of Montana, believed that a better use of the range by reducing labor costs and utilizing waste products would be beneficial.

The Administration of Experiment Station Work by Projects was discussed in a paper by Dr. E. W. Allen, of this Office, who concluded as follows: "The project plan of administration seems to furnish the most reliable basis for administering the work and the funds of an experiment station, and has proved satisfactory. It enables a proper consideration of new undertakings, before funds are assigned to them; it insures more thorough planning; it provides a record of the station's activities; it enables the work to be followed up from time to time, and to be concluded when it ceases to be profitable; it assists in defining the scope of station work and in holding it within its proper field; it tends toward general economy; it enables a budget to be made up intelligently, in accordance with the needs or relative importance of individual undertakings; it provides against inadvertently overloading the program of work, so that features of it become ineffective for lack of funds; and it gives an effective basis for discussion and reporting upon the station's work, and for explaining the use of its funds."

Much interest in the subject was manifested in the discussion following, with a general concurrence in the advantages of the project system.

The final paper in the section was by Director S. B. Doten, of Nevada, entitled *How Can We Advance the Scientific Character of the Work Done in the American Agricultural Experiment Stations?* Director Doten believed that the value of a high grade of research is at last becoming recognized, but that every effort must be made to retain suitable men when discovered. Among the conditions favorable to research he cited noninterference with the time, the plans, and the work of the investigator, and at the same time supplying the stimulation of his best efforts by real leadership. He also advocated the encouragement of graduate work among the staffs and the accrediting of station work of the proper grade in the conferring of degrees. Director C. D. Woods, of Maine, stated that the University of Michigan was already making arrangements along this line.

By vote of the section, its 1915 program is to consist entirely of subjects directly relating to experiment station organization and policy.

SECTION ON EXTENSION WORK.

The extension section opened its program with a joint session with the American Association of Farmers' Institute Workers. At this, Dr. A. C. True took up the question of the use of the Smith-Lever funds for farmers' institutes as a phase of extension work. In this he drew attention to the strictly educational character of the extension work contemplated by the act, and the great stress laid on practical demonstrations. The farmers' institutes, therefore, come within the provisions of the law only as far as they may be agencies through which the colleges can carry on work of this type. Where the institute system is directly connected with the colleges, it is believed that they may be easily modified and restricted in scope so as to give them a distinctive place in the extension system. In States where the institutes are under the direction of other agencies, their maintenance apparently does not come within the provisions of the law, though there may be cooperation and participation by the college staffs. The eventual establishment of a county-agent system will also affect the situation. Conditions as to farmers' institute administration at present vary so widely in different States that apparently the first need is a standardization of the institute. See also the editorial discussion on page 4.

The relation of farmers' institutes to organized extension agencies was also discussed by Prof. G. I. Christie, of Indiana. He believed that the institute is still fulfilling a practical need and should receive the assistance of the extension staff, but should be correlated with other extension work and brought under the supervision of the colleges.

As an example of a model farmers' institute address, Director C. E. Thorne gave a paper on Maintaining Crop Production, based largely upon the findings of the Ohio Station. Former Dean L. H. Bailey, of Cornell University, closed the joint session with an address on The Present Responsibility of the Rural People. This had special reference to the conditions brought about by the European war, and emphasized the political responsibility of rural people in the progress of the nation.

At a subsequent session, C. B. Smith, of the States' Relations Committee of this Department, presented a paper on the Problem of Placing County Agencies in Effective Touch with Farmers. He described some of the means that have been found effective, among them the following: "Work through organizations; deal with individuals but primarily only as they represent groups of farmers; know what the agriculture of the county is from first-hand sources, and on the basis of such information undertake demonstrations, supplemented by propaganda work, by lectures, and the press; write and talk with the facts of local agriculture arranged in such a convincing way as to induce action; utilize the public school system and work with the boys and girls—through them you also reach the hearts of fathers and mothers, the field, and the home; utilize the automobile excursion, the college excursion, the county picnic, the farmers' meetings, the county fairs, etc., for social purposes, demonstrations, educational exhibits, and instruction; get behind and push every helpful agricultural movement in the county; put in a county agent who knows agriculture technically and practically, whose heart is in his work, and whose highest delight is in rendering service."

In a paper entitled Correlating the Extension Work of the Colleges with Other Agencies in the State, Prof. C. R. Titlow of West Virginia defined an extension department as the head of itinerant education in a State. It was claimed that

this department of the college can render its best service by utilizing the existing organizations, both official and nonofficial, within the State. This can be done by properly coordinating and federating such organizations. A chart was exhibited showing graphically the correlation of extension work with other agencies.

Planning Extension Work by Means of Definite Written Projects was the title of a paper by Prof. C. D. Jarvis of Connecticut. This paper made three principal recommendations: (1) A central committee at the college to settle upon all proposed projects and submit them through the proper authorities to the federal authorities, (2) a methodical grouping and subgrouping of projects, and (3) the application of a seasonal sequence in project planning, even to the making of a monthly, daily, and hourly schedule for extension representatives.

Prof. K. L. Hatch, of Wisconsin, submitted a report from the committee on the training of extension teachers, advocating the provision of technical training along the special line of the prospective extension work, and instruction in the art of teaching. He suggested that the time necessary for this training might be secured by eliminating requirements of foreign languages and mathematics. Teachers of approved ability in secondary agricultural schools were suggested as a promising source of supply for extension work.

The section committee on extension work was abolished, the belief being expressed that its function was being substantially performed by the association committee on extension organization and policy.

RECENT WORK IN AGRICULTURAL SCIENCE

AGRICULTURAL CHEMISTRY—AGROTECHNY.

Phytin and phytic acid, G. CLARKE (*Jour. Chem. Soc. [London]*, 105 (1914), No. 617, pp. 535-545).—The phytin studied in this work was obtained from the seeds of Indian field mustards, a mixture of *Brassica juncea* and *B. campestris*. Dilute acetic acid was preferred to very dilute hydrochloric acid for the extraction because it was found that the extracts obtained by the latter were difficult to handle. The free acid liberated from air-dried phytin of homogeneous composition consisted of a mixture of approximately equal quantities of an organic phosphoric acid (phytic acid) and phosphoric acid.

"A solution of the ammonium salt of the organic phosphoric acid, prepared from a pure strychnin salt [melting point, 203 to 204° C., uncorrected], gave no precipitate on warming to 60° with a nitric acid solution of ammonium molybdate, and only a very slight one on remaining at that temperature for several hours.

"An explanation of the behavior of phytin is that it is not simply a salt of an inositolphosphoric acid, but a complex substance, possibly a complex calcium-magnesium salt of an inositolphosphoric acid and phosphoric acid, and, on removing the bases, yields the two acids. The fact that the composition of pure phytin, prepared as described, corresponds with no calcium-magnesium salt of a simple acid ester of inositol and phosphoric acid gave support to this view. The strychnin salt of the organic phosphoric acid, isolated from the mixture of acids obtained from phytin, on the other hand, gave results on analysis in agreement with salts of simple inositolphosphoric acids."

The acid tribarium phytate preparation of Anderson (*E. S. R.*, 27, p. 406), prepared by precipitation from a 0.5 per cent hydrochloric acid solution by the addition of an equal volume of alcohol, "was probably one of the purest derivatives of phytic acid hitherto isolated, but it seemed not impossible from the methods of preparation that the salt as well as the acid prepared from it might contain some phosphoric acid."

"The phytin prepared [in these investigations] was a snow-white, amorphous powder, resembling in properties the substance described by Schulze and Winterstein. It contained carbon, hydrogen, phosphorus, calcium, and magnesium, but no trace of nitrogen could be detected. It was insoluble in hot and cold water, readily soluble in very dilute mineral acids, and soluble in cold, but sparingly so in hot dilute acetic acid. It was precipitated from a cold 8 per cent acetic acid solution on boiling, completely redissolving when allowed to cool. . . .

"It was somewhat difficult to obtain phytin in an anhydrous condition. After heating for several hours at 110° in a vacuum over phosphoric oxid it still continued to lose weight. When heated under similar conditions at 180° for five hours it became constant in weight, and remained so after prolonged heating for many hours. The anhydrous substance, dried at 180° and dissolved in dilute acetic acid, was precipitated again unchanged by boiling."

Organic phosphoric acids of wheat bran, R. J. ANDERSON (*New York State Sta. Tech. Bul. 36* (1914), pp. 3-20).—This work comprises two papers.

I. *Concerning the organic phosphoric acid compound of wheat bran*, II (pp. 3-16).—In a preliminary report (E. S. R., 28, p. 17) it was emphasized that the organic phosphoric acid isolated from wheat bran is different from that of phytic or inosit phosphoric acid which is present in other grains and seeds, and an acid was obtained which approximately agreed with the formula $C_{20}H_{35}O_{10}P_9$. Inasmuch as Rather reported silver salts of an organic phosphoric acid of the formula $C_{12}H_{14}O_{12}P_9$ (E. S. R., 29, p. 804), the former work has been critically repeated. The work of Rather was also repeated, "following his method of isolating the crude acid as closely as possible. The acid preparation obtained in this way was divided into two parts: One portion was used for the preparation of the silver salt as described by the above author; the other portion was transformed into the barium salt and purified in accordance with our previous method.

"The barium salts which were obtained in this way were found to agree very closely in composition with those previously reported, viz: $C_{20}H_{35}O_{10}P_9Ba_5$ and not with salts of the acid $C_{12}H_{14}O_{12}P_9$. The silver precipitates which were obtained from the crude acid varied in composition according to the method of preparation, but in one case the substance had approximately the composition stated by Rather. A simple examination of these silver precipitates quickly revealed the fact, however, that they were not 'pure homogeneous salts' of an organic phosphoric acid of the formula $C_{12}H_{14}O_{12}P_9$, . . . but that they were largely contaminated with inorganic silver phosphate—varying from 42 to 90 per cent."

The silver precipitates obtained from cotton-seed meal and wheat bran had different physical properties although they may have approximately the same composition. That from wheat bran is sensitive to light and only white at the moment of precipitation, while that from cotton-seed meal is pure white in color and only slightly affected by light.

In this work it was again "impossible to isolate any salts of phytic acid or inosit hexaphosphate. The amorphous barium salts obtained agreed in composition with those previously reported. It appears probable, however, that these amorphous salts are not homogeneous, but that they are mixtures of salts of various organic phosphoric acids. The isolation of definitely homogeneous compounds from this mixture has not succeeded. Attention is called to the rather large content of oxalates in the crude organic phosphoric acid compound and also to the high percentage of inorganic phosphate contained in wheat bran."

II. *Concerning inosit monophosphate, a new organic phosphoric acid occurring in wheat bran* (pp. 16-20).—The work here reported was carried on at the First Chemical Institute of the University of Berlin.

A previous notice (E. S. R., 28, p. 17) and the above paper indicated that the crude organic phosphorus compound of wheat bran can be separated into two portions by treatment with barium hydroxid.

"The insoluble precipitate which forms under these conditions contains the barium salts of certain not yet identified organic phosphoric acids and it is free from nitrogen. By evaporating the filtrate from the above insoluble barium salts a substance is obtained which is rich in nitrogen and which also contains phosphorus in organic combination. In the further investigation of this soluble nitrogen-containing substance it was found that its aqueous solution gave an insoluble precipitate with lead acetate. The only other salt which gave any precipitate was copper acetate and then only on warming, when a bluish-white amorphous precipitate was produced which dissolved completely on cooling."

The precipitate obtained with lead acetate was perfectly white, and when decomposed with hydrogen sulphid and the solution concentrated in a vacuum

a practically colorless sirup was obtained. By scratching with a glass rod the sirup crystallized to a white solid mass, and when the substance was recrystallized from water having an addition of alcohol "it was obtained in beautiful colorless star-shaped aggregates of plates or long prisms. On slowly concentrating its aqueous solution it crystallizes in large colorless prisms with pointed ends, being often arranged in star-shaped bundles. It is, however, so soluble in water that it is more expedient to crystallize it from water with addition of alcohol.

"The substance was free from bases, also free from nitrogen and sulphur, but it contained phosphorus in organic combination. Analysis showed that it was inosit monophosphate, $C_6H_{13}O_6P$, or $C_6H_5(OH)_5O.PO(OH)_2$. On cleavage either with dilute sulphuric acid at 120° or higher or with 10 per cent ammonia at 150° in a sealed tube it decomposes into inosit and phosphoric acid. Inosit monophosphate has not been known previously, so far as we are aware, and we believe that this is the first time that it has been isolated." A compound like inosit monophosphate is known to exist in nature (see abstract of Clarke, p. 16).

"It appears probable that in certain plants the organic phosphoric acids may be present not only as phytic acid or inosit hexaphosphate, $C_6H_{13}O_{24}P_6$, but also as lower phosphoric acid esters of inosit. From wheat bran, for instance, we have been unable to isolate any inosit hexaphosphate. The insoluble barium salts of the organic phosphorus compound obtained from this material are evidently mixtures of various organic phosphoric acids, either lower inosit phosphates or phosphoric acid esters of other carbohydrates."

Thus far it has not been possible to separate any homogeneous substance from this mixture. "The isolation of inosit monophosphate only succeeded because its properties are so different from those of the other organic phosphoric acids which exist in wheat bran—for instance, its easily soluble barium salt permitted its separation from the other acids which give insoluble barium salts."

No data were obtained on the quantitative percentage of inosit monophosphate in wheat bran. The author wishes to reserve the study of the physiological properties of this substance in connection with the general investigation to be carried out at the station.

Carotin, the principal natural yellow pigment of milk fat, I-IV, L. S. PALMER and C. H. ECKLES (*Missouri Sta. Research Buls.* 9 (1914), pp. 313-336; 10 (1914), pp. 339-387, figs. 5; 11 (1914), pp. 391-411; 12 (1914), pp. 415-450).—The investigations reported were conducted in cooperation with the Dairy Division of this Department, and were primarily to study the chemical nature of the yellow milk fat pigments and to classify each from a scientific standpoint. "At the same time information was gathered with the hope of ascertaining to what extent the generally accepted views concerning the color of milk fat are correct in order to establish a scientific basis for the subject which would be of value to those interested in the handling of dairy products in a commercial way."

Bulletin 9, as Part I, gives a review of the literature concerning the yellow plant and animal pigments, to which a bibliography of 66 titles is appended. Bulletin 10, as Part II, discusses the chemical and physiological relations of pigments of milk fat to the carotin and xanthophylls of green plants; Bulletin 11, as Part III, the pigments of the body fat, corpus luteum, and skin secretions of the cow; and Bulletin 12, as Part IV, (a) the yellow pigment of blood serum, (b) carotin and xanthophylls during digestion, and (c) the pigments of human milk fat.

The data reported in Parts II, III, and IV have been previously noted from another source (E. S. R., 31, p. 273).

Lactochrome, the yellow pigment of milk whey.—Its probable identity with urochrome, the specific yellow pigment of normal urine, L. S. PALMER and L. H. COOLEGE (*Missouri Sta. Research Bul.* 13 (1914), pp. 453-487, pls. 2).—In this study in cooperation with the Dairy Division of this Department, the authors conclude that "lactochrome, the yellow pigment of milk whey, is very closely related in chemical and physical properties to urochrome, the specific yellow pigment of normal urine, and is very probably identical with it. Alcoholic solutions of lactochrome, or aqueous solutions containing a little alcohol, on treatment with 'active' acetaldehyde and heat, are transformed into solutions whose spectroscopic and other properties are practically identical with those of urobilin. On continued action of the aldehyde a secondary pigment is formed with still different spectroscopic properties. In these two properties lactochrome is identical with similar solutions of urochrome. A concentrated aqueous solution yields a yellow granular compound on bromination which gives a strong reaction for pyrol, and in almost all of its other properties is identical with a similar compound obtained on bromination of a concentrated aqueous solution of urochrome.

"The presence of lactochrome was found to be characteristic of the milk of all breeds of cows tested, i. e., Ayrshire, Jersey, Holstein, and Shorthorn. The amount of lactochrome appears to be largely a breed characteristic, with the Ayrshire and Jersey breeds ranking considerably above the Holstein and Shorthorn. The presence of comparatively large amounts of lactochrome in the milk of some animals is of considerable importance in imparting to milk its characteristic yellow color. Lactochrome was found in sheep's milk, often in much larger quantities than in cow's milk, and was also found in traces in human milk."

A bibliography of 19 titles is appended.

The nature of enzym action, W. M. BAYLISS (*London, New York, Bombay, and Calcutta, 1914, 3. rev. ed., pp. VIII+180, figs. 7*).—In this third edition (E. S. R., 25, p. 609) a considerable amount of new material has been incorporated and certain paragraphs have been revised. "Attention is particularly directed to the chapters on 'reversibility' and on the 'combination' between enzym and substratum, as also to the section on antienzymes, which have, for the most part, been rewritten."

About the lipase of Chelidonium seeds, K. BOURNOT (*Biochem. Ztschr., 52 (1913), No. 3-4, pp. 172-205; abs. in Zentbl. Expt. Med., 4 (1913), No. 13, pp. 589, 590*).—The lipase of Chelidonium seed, like Ricinus lipase, is soluble in water and glycerol, but in addition it is somewhat soluble in ether or petroleum ether. In contradistinction to castor-bean lipase, it acts best in water containing no additions of other substances.

Formation of humic substances by the action of polypeptids upon sugar, L. C. MAILLARD (*Compt. Rend. Acad. Sci. [Paris], 156 (1913), No. 15, pp. 1159, 1160; abs. in Zentbl. Expt. Med., 4 (1913), No. 10, p. 435*).—The formation of humic substances depends upon the substitution of NH_2 groups of amino acids by COH or CO groups of reducing sugars with the evolution of carbon dioxide from the terminal carboxyl groups of acids. Inasmuch as the polypeptids have a terminal NH_2 and a terminal COOH group, it seems plausible to assume that by the transformation of sugars humic substances can be obtained. It was also found possible to obtain these substances from xylose and glycylglycin and from peptones.

Colloidal chlorophyll and the changes of position in the absorption bands in living plant leaves, D. IWANOWSKI (*Biochem. Ztschr., 48 (1913), No. 4,*

pp. 328-331, fig. 1).—A polemic with Herlitzka (E. S. R., 28, p. 407) in regard to priority.^a

A dilution colorimeter and some remarks in reference to the experimental error in comparing colors, R. V. STANFORD (*Hoppe-Seyler's Ztschr. Physiol. Chem.*, 87 (1913), No. 3, pp. 159-170, pl. 1, figs. 2).—The apparatus is illustrated and sectional views of it are shown.

A color reaction for proteins, L. LEWIN (*Med. Klinik*, 9 (1913), No. 28, p. 1122; *abs. in Zentbl. Expt. Med.*, 4 (1913), No. 14, p. 635).—Triformoxim (trioximinimomethylen, Kahlbaum, 0.1 to 0.15 gm. dissolved in 100 gm. of commercial sulphuric acid) yields with egg albumin, serum albumin, casein, peptones, nucleoproteins and other proteins, and papain, a coagulation ring at the point of contact with the reagent. The ring on agitation becomes a violet coloration. With this sensitive reaction traces of proteins can be detected in saliva. Indol gives the same reaction.

About the detection of histidin, K. INOUE (*Hoppe-Seyler's Ztschr. Physiol. Chem.*, 83 (1913), No. 1, pp. 79-82).—The method depends on the formation of an azo coloring matter. If diazobenzolsulphonic acid, in the presence of an excess of sodium carbonate, is added to free histidin a cherry-red coloration is obtained. The reaction is sensitive to a dilution of 1:100,000. Tyrosin when present may be rendered inactive by shaking with benzoyl chlorid.

The detection of saponins, III, J. RÜHLE (*Ztschr. Untersuch. Nahr. u. Genussmtl.*, 27 (1914), No. 1-3, pp. 192-200).—Eight coloring matters intended for coloring lemonade, effervescent beverages, etc., did not have any hemolytic properties. Two sapogenins prepared from the saponins of soap root and soap bark were found to be four times as soluble in ether as the saponins from which they were obtained. Both sapogenins, as well as that prepared from guaiac bark, showed slight but definite hemolytic properties. The saponins, saponic acid, and acid saponins from guaiac bark were still hemolytic in dilutions of 1:5,000.

It is concluded that the addition of saponin to effervescent drinks should not be permitted. See also previous work (E. S. R., 20, p. 612; 27, p. 505).

Detection and differentiation of poisonous and nonpoisonous saponins by hemolysis and the conclusions to be drawn therefrom, J. HALBERKANN (*Abs. in Apoth. Ztg.*, 28 (1913), No. 13, p. 118; *Zentbl. Bakt. [etc.]*, 1. Abt., Ref., 59 (1913), No. 1, p. 12).—The poisonous saponins when combined with cholesterol become nontoxic. Saponins act upon the membranes of the red blood corpuscles and consequently allow an escape of the hemoglobin. Perhaps hemolysis is due to the action of the cholesterol. According to these investigations toxicity and hemolysis run parallel because a saponin which exerts no or only a slight hemolysis has only a slight action on man and animals. For detecting saponins, a 1 per cent suspension of blood corpuscles is exposed to saponin solutions of various strengths. The method can be used for estimating saponins in mineral waters.

Determination of glycerol in wine, with especial reference to a new simple method, S. ROTHENFUSSE (*Ztschr. Untersuch. Nahr. u. Genussmtl.*, 26 (1913), No. 10, pp. 535-544, fig. 1).—The method consists essentially of oxidizing the glycerol to oxalic acid and titrating the latter with a standard solution of potassium permanganate.

A new method for differentiating human from cow's milk and a contribution to the study of the lipolytic milk ferments, H. DAVIDSOHN (*Ztschr. Kinderheilk., Orig.*, 8 (1913), No. 1, pp. 14-23; *abs. in Ztschr. Immunitätsf. u. Expt. Ther.*, II, Ref., 7 (1913), No. 8, p. 383).—On adding 1 to 2 drops of

^a Ber. Deut. Bot. Gesell., 25 (1907), No. 8, pp. 416-424, pl. 1.

tributyrin to from 5 to 10 cc. of milk and then shaking slightly, woman's milk gives in a few minutes a marked penetrating odor of butyric acid. This does not occur with cow's milk.

The reaction is recommended for the differentiation of raw human from raw cow's milk, and also raw from boiled human milk, since the action depends upon the presence of a lipolytic ferment in woman's milk. The hemolysin noted in woman's milk is identical with the lipolytic cleavage products (soaps) obtained from the milk fat when the milk is kept in the refrigerator for 24 hours.

The so-called nitrogen-free extractive substances in feeds and foodstuffs, J. KÖNIG (*Ztschr. Untersuch. Nahr. u. Genussmtl.*, 26 (1913), No. 6, pp. 273-281, fig. 1).—On the basis of investigations reported previously (E. S. R., 18, p. 664; 23, p. 110) the nitrogen-free extractive substances may be grouped into four classes, namely, pentosans, hexosans, lignins, and cutins. The first three groups, which occur in feeding stuffs in various condensation or soluble forms, are here described. It is deemed essential when examining this class of material to use the same method the world over in order to obtain comparative results. The methods of analysis are regarded as by no means perfect.

Some effects of feeds upon the properties of lard, I, II, C. L. HARE (*Jour. Indus. and Engin. Chem.*, 2 (1910), No. 6, pp. 264-268; 5 (1913), No. 5, pp. 410-414, figs. 6).—Summarizing the results of the first of these papers, it was found that "corn may be fed without regard to time limit in so far as concerns any unfavorable effect on the properties of the lard. Soy beans and peanuts both produce oiliness in the hogs and the lards resulting are extremely soft. The fat of oily hogs can be hardened by rations of corn, cotton-seed meal, or tankage—the two latter producing unusually firm lards. The possibility is suggested that legumes when fed green may produce soft fats."

The wide differences in properties which may be conferred upon lards by different feeds are shown by the following figures: A pig selected from the soy-bean fed lot had lard with an iodine value of 100.5, an iodine value of the liquid fatty acids 119, and a saponification value of 197.5, while a pig fed slaughter-pen refuse and weighing about 200 lbs. when slaughtered, showed for the lard an iodine value of 40.35, an iodine value of the liquid fatty acids 78, a saponification value of 203.2, and a melting point of 48.2. The lard of this second pig presented much the appearance of beef tallow and its constants possessed much the same value as those of beef fat. It also responded readily to the Belfield test for beef fat.

The second paper reports the results of examining more than 200 samples of lards. It is shown that "fats change in composition with remarkable readiness under the influence of certain feeds, small amounts of these feeds producing striking changes in the properties of the fats." "Corn, and mixed feeds containing corn with wheat shorts, skim milk, or cowpeas, produce fats which possess like properties. Tankage produces a slightly firmer fat, while cotton-seed meal produces fats which contain small amounts of unsaturated acids, and which may remain solid at temperatures of 100° F. or above. Soy beans and peanuts produce lards which contain extreme amounts of unsaturated acids and are fluid at ordinary temperatures."

"Between the ages of 4 months and 8 months, age of the animal has essentially no influence upon the properties of the lard. Using feeds differing as much as 5 per cent in protein content, there is observed no change in the properties of the lards produced therefrom. With the advent of the various new feeds used in pork production, the iodine absorption number of a lard possesses no value as a means of detecting adulteration."

The identification and quantitative determination of sodium chlorid in feeds, A. STRIGEL (*Landw. Vers. Stat.*, 82 (1913), No. 1-2, pp. 149-158).—Salt is said to be added to linseed for the purpose of aiding the extraction of the oil. When added to the meal after extraction it is evidently done for the purpose of increasing its palatability, and probably at times to cover up a moldy feed or a feed adulterated with materials of low nutritive value.

An exact determination of sodium chlorid in feeding stuffs and also in condimental foods can be made by extracting the substance by shaking it with water. The aqueous solution obtained is evaporated with the addition of sodium carbonate and potassium nitrate and is then ashed. The chlorin is determined in a solution of the residue. Direct ashing of the feed is not permissible because losses of chlorin occur. The water extracts can not be titrated directly with silver nitrate using potassium chromate as an indicator on account of lack of sharpness in the end-point, and titration according to Volhard's method in a nitric acid solution is recommended. As a preliminary test the sodium chlorid can be separated from the feed with chloroform.

The action of refined sugar on Fehling's solution in the Herzfeld method for the determination of invert sugar, F. STROHMER (*Österr. Ungar. Ztschr. Zuckerind. u. Landw.*, 42 (1913), No. 3, pp. 539-545; *abs. in Chem. Abs.*, 7 (1913), No. 23, p. 4091).—When Fehling's solution is heated according to the directions prescribed for this method there is a tendency toward the separation of varying amounts of cuprous oxid. The separation increases even though the sugar is free from invert sugar because of the fact that even chemically pure saccharose has a slight reducing power. In an alkaline solution pure saccharose undergoes inversion, the degree being proportional to the alkalinity, the length of time of boiling, and the quantity of saccharose entering into reaction. No definite proportional relation seems to exist between the amount of organic and inorganic nonsugars on the one hand and the reducing power on the other. When a reduction below 50 mg. of metallic copper is obtained, this error may be disregarded.

Bacteriological investigations of sugar cane products, W. L. OWEN (*Louisiana Stas. Bul.* 146 (1914), pp. 78, figs. 6).—In anticipation of future demands for reliable methods for use in the sugarhouse, this investigation of the comparative values of various culture media for the quantitative estimation of the micro-organisms in sugar-house products was instituted.

The relative rank of the different culture media employed is given in the following table:

Comparative value of culture media for estimation of micro-organisms in sugar-house products.

Raw juice.	Clarified juice.	Massecurite.	Raw sugar.
Plain agar.....	Sucrose agar.....	Raw juice agar.....	Sucrose agar 50 per ct.
Sucrose agar.....	Plain agar.....	Plain agar.....	Sucrose agar 25 per ct.
Raw juice.....	Raw juice.....	Raw juice.....	
Peptone agar.....	Peptone agar.....	Peptone agar.....	Plain agar.
Raw sugar.....	Molasses.....	Molasses.....	
Peptone agar.....	Peptone agar.....	Peptone agar.....	Sucrose agar 10 per ct.
Molasses.....			
Peptone agar.....	Raw juice agar.....	Molasses agar.....	
Molasses agar.....	Raw juice.....	Sucrose agar.....	
	Peptone agar.....		
Raw juice agar.....	Molasses agar.....	Raw juice.....	
		Peptone agar.....	
Raw sugar agar.....	Raw sugar agar.....	Raw sugar agar.....	

"The superior value of the higher density media for the estimation of micro-organisms in sugars is believed to be due to the injurious influences exercised upon one class of these micro-organisms by the change from the density of the film of moisture around the sugar crystals to the low density media. The methylene blue reduction method is inapplicable to the quantitative estimation of micro-organisms in sugars. The most favorable reaction for the culture medium is neutrality with phenolphthalein as an indicator. The growth of the micro-organisms of sugars upon high density media is slower than upon those of low density. The basis of Smith's formula for the sucrose agar,^a which has been used for the determination of micro-organisms in sugars, has been proved to be essentially correct."

See also a previous note (E. S. R., 25, p. 110).

Progress made in the field of cocoa and chocolate manufacture in the years 1905-1912, R. BÖHME (*Chem. Ztg.*, 37 (1913), Nos. 51, pp. 517-519; 53, pp. 542, 543; 56, pp. 574, 575).—This deals with the chemical, technical, and legal aspects of the industry.

On the protein substances of barley in the grain itself and during the brewing processes.—III, Transformation of the protein matters during mashing, boiling of wort, and fermentation, H. SCHJERNING (*Compt. Rend. Lab. Carlsberg*, 9 (1913), No. 4, pp. 237-396, fig. 1).—This is a continuation of the studies previously noted (E. S. R., 23, p. 412), and brings out the fact that the transformation of protein takes place chiefly during germination and is proportional in extent to the duration of the latter. On the other hand, the more important changes taking place in the carbohydrates and mineral substances occur during the mashing process, the optimum temperature lying around 70° C. The velocity or facility with which protein transformation takes place, as measured by the author's precipitation method, is not in inverse ratio to the total nitrogen content of the dry substances of the barley.

The value of barley for malting purposes depends not only upon its behavior during the steeping process but also on the length of time it requires to complete the protein transformation during germination. A faulty transformation of albumin and similar substances during germination can not be rectified by the subsequent mashing process.

The concentration of the hydrogen ions was not affected by the steeping, germination, and mashing processes in themselves. "The measurements of the numerical values of the different protein transformation processes by the precipitation method, and of the extent of peptid splitting through a formol titration, act as supplements, but can not replace each other. The protein transformation processes mark the proteolysis down to the formation of the most complex amin-amid compounds, while the peptid splitting particularly marks the decomposition of the most complex into the less complex amin-amid compounds."

The remainder of the work deals with the influence of the mashing process, i. e., fineness of the grist, concentration of mash, mashing temperature, duration of initial mashing, duration of boiling, elutriation (sparging) of husks (grains), and the salt effect; the boiling of the wort, viz, duration of boiling, the proportion of hops, effect of the hops upon the substances existing in the wort itself, the temperature or pressure, wort concentration, oxygenation during boiling, and the quality of the hops, etc.; and fermentation (primary and secondary).

The thirty-first general meeting of the society of starch interests in Germany, 1913, E. PAROW (*Chem. Ztg.*, 37 (1913), No. 34, pp. 345, 346).—A report of the activity of the laboratories of this society.

^a Proc. Linn. Soc. N. S. Wales, 26 (1901), pt. 4, pp. 674-683.

METEOROLOGY—WATER.

Treatise on meteorology, J. VINCENT (*Traité de Météorologie. Brussels, 1914, pp. VIII+418, figs. 176*).—This is a general treatise on the subject containing chapters on general information about the air, temperature of the air, aqueous vapor in the air and its condensation, the barometer, the thermal state of the atmosphere, polar auroras, water spouts, the weather, electrical phenomena, the climate of different zones of the earth, and the climate of Belgium.

Bulletin of the Mount Weather Observatory (*U. S. Dept. Agr., Bul. Mount Weather Observ., 6 (1914), pt. 5, pp. 195-265+IV, pls. 3, figs. 18*).—This, the final number of this series of bulletins, contains the following articles: The Design and Theory of a Mechanism for Illustrating Certain Systems of Lines of Force and Stream Lines (illus.), by W. H. Roever; The Relation Between Solar Radiation Intensities and the Temperature of the Air in the Northern Hemisphere in 1912-13 (illus.), by H. H. Kimball (see below); The Diurnal System of Convection: A Summary of the Free Air Data Obtained at Mount Weather for the Fiscal Year July 1, 1912, to June 30, 1913 (illus.), by W. R. Blair; and Free Air Data at Mount Weather from July 3, 1913, to May 7, 1914, on "International Days," by W. R. Blair. A general index to Volumes 1-6 is appended.

The relation between solar radiation intensities and the temperature of the air in the Northern Hemisphere in 1912-13, H. H. KIMBALL (*U. S. Dept. Agr., Bul. Mount Weather Observ., 6 (1914), pt. 5, pp. 205-220, fig. 1*).—Attention is called in this paper especially to the fact that "following the eruption of Katmai Volcano, in Alaska, in June, 1912, a cloud of high haze or dust was gradually distributed throughout the atmosphere of the Northern Hemisphere and caused a marked diminution in the intensity of direct solar radiation. This diminution reached its maximum at Mount Weather, Va., in August, 1912, and was noticeable until nearly the end of 1913. There was at the same time an increase in the quantity of heat received diffusely from the sky, but the net result was a decrease in the amount of heat energy received at the surface of the earth."

The thunderstorm and its phenomena, W. J. HUMPHREYS (*Mo. Weather Rev., 42 (1914), No. 6, pp. 348-380, figs. 22, pl. 1; Jour. Franklin. Inst., 178 (1914), No. 6, pp. 751-776, figs. 6*).—Among the topics discussed in these articles are the origin of thunderstorm electricity; periodic recurrence and distribution of thunderstorms; thunderstorm pressures, temperatures, humidity, and velocity; hail; lightning and its effects; and thunder.

It is pointed out among other things that the sudden downpour of rain which frequently follows heavy claps of thunder is not due to the latter but to changes in electrification. It is shown that one of the important chemical effects of electrical discharges accompanying thunderstorms is the abundant formation of oxids of nitrogen and ammonia. It is stated that "there is no obvious and close relation between the thunderstorm and normal atmospheric electricity; that, according to our best evidence, they are distinct and independent phenomena."

A list of references to literature on the subject is given.

Monthly Weather Review (*Mo. Weather Rev., 42 (1914), Nos. 5, pp. 257-308, pls. 8, figs. 17; 6, pp. 309-407, pls. 10, figs. 55*).—In addition to notes on weather forecasts for May and June, 1914, river and flood observations, lists of

additions to the Weather Bureau library and of recent papers on meteorology, notes from the Weather Bureau library, the weather of these months, a condensed climatological summary, and climatological tables and charts, these numbers contain the following articles:

No. 5.—The Influence of Meteorological Conditions on the Propagation of Sound (illus.), by H. Bateman; The Mechanics of Atmospheric Air Within Cyclones and Anti-Cyclones, by M. Möller; The Halos of November 1–2, 1913; Remarkable Halo at Pueblo, Colo., February 6, 1914, by L. H. Daingerfield; Unusual Solar Halos Seen in Kansas on February 24, 1914; The Solar Halos as seen at Topeka (illus.), by S. D. Flora; The Solar Halos at Iola (illus.), by H. K. Holcomb; The Solar Halos as Seen at Garnett, Kans. (illus.), by D. D. Judy; Land and Sea Breezes, by R. DeC. Ward; Graphical Integration of Functions of a Complex Variable with Applications (illus.), by S. D. Killam; Notes on the Formation of Glazed Frost, by T. Okada; Haze of May 13 to May 17, 1914; and The Thermal Regions of the Globe, by A. J. Herbertson.

No. 6.—Solar Radiation Intensities at Mount Weather, Va., during April, May, and June, 1914, by H. H. Kimball; Photometric Measures of the Zodiacal Light (illus.), by M. Hall; The Distribution of Snowfall in Cyclones of the Eastern United States (illus.), by C. F. Brooks; On the Influence of the Deviating Force of the Earth's Rotation on the Movement of the Air (illus.), by N. Ekholm; Meteorology at the Lick Observatory (illus.), by W. G. Reed; The Neglect of Atmospherics; The Weather Versus Coal Mine Disasters; The Ultimate Cause of our Weather; The Planets and the Weather, by W. J. Humphreys; The Thunderstorm and Its Phenomena (illus.), by W. J. Humphreys (see p. 24); Flood Studies at Los Angeles (illus., by F. A. Carpenter; and Artificial Deepening of the Arkansas at Wichita, Kans. (illus.), by A. J. Henry.

Weather records, C. C. GEORGESON (*Alaska Stas. Rpt. 1913, pp. 74–80*).—Observations on temperature, precipitation, and condition of the weather at different places in Alaska from December, 1912, to December, 1913, inclusive, are recorded as usual.

Climate and meteorology, A. J. CONNOR (*Canada Yearbook, 1913, pp. 113–122, figs. 3*).—The climatic and meteorological conditions in the Dominion of Canada are summarized from all available data up to and including the year 1913.

British rainfall, 1913, R. C. MOSSMAN and C. SALTER (*London, 1914, pp. 92+384, pls. 4, figs. 76; rev. in Nature [London], 94 (1914), No. 2341, p. 33*).—As in previous years, the fundamental part of this report includes general tables of total rainfall and observers' remarks on the weather. Among the topics discussed are monthly and seasonal rainfall, heavy daily falls, and the relation of the annual rainfall to the average. An account is given in some detail of a great rainstorm on September 17 centering near Doncaster.

The volume includes three special articles: (1) An appreciative memoir of the late Sir John Murray, who represented Scotland on the board of trustees of the British Rainfall Organization; (2) the dry summer of 1913, the rainfall deficiency during July and August being 60 per cent over the United Kingdom as a whole; and (3) the frequency of heavy rains in short periods, 1868–1913.

The rainfall of the year over the whole of the British Isles was almost exactly equal to the average for 35 years (1875–1909). There was an excess in Wales of 9 per cent, and in Ireland of 7 per cent. Elsewhere there was, generally speaking, a deficiency.

SOILS—FERTILIZERS.

Soil mapping and soil instruction, WILHELM GRAF ZU LEININGEN (*Centbl. Gesam. Forstw.*, 40 (1914), No. 3-4, pp. 81-97).—The author discusses soil mapping from the viewpoint of the farmer and the forester, pointing out its uses and what in his opinion it should cover. A list of references to related literature is included.

The question of soil maps, GRAF ZU LEININGEN (*Naturw. Ztschr. Forst u. Landw.*, 12 (1914), No. 3, pp. 114-122; abs. in *Internat. Inst. Agr. [Rome]*, *Mo. Bul. Agr. Intel. and Plant Diseases*, 5 (1914), No. 5, p. 624).—This article covers substantially the same ground as that noted above.

Soil survey of Pinellas County, Florida, G. B. JONES and T. M. MORRISON (*U. S. Dept. Agr., Advance Sheets Field Operations of the Bureau of Soils*, 1913, pp. 31, pls. 6, fig. 1, map 1).—This survey, issued September 30, 1914, deals with an area of 166,400 acres of varied topography on the mid-west coast of Florida containing seven different types of soil in six series as follows: Norfolk, Leon, Parkwood, and Plummer which are gray soils, and Portsmouth and Fellowship which are black, besides four miscellaneous types of muck, swamp, coastal beach, and tidal marsh soils. Of these soil types the most important and valuable is the Norfolk fine sand. "There is a large acreage of undeveloped land in the county." Drainage is deficient in many cases.

McDonough County [Illinois] soils, C. G. HOPKINS, J. G. MOSIER, J. H. PETTIT, and O. S. FISHER (*Illinois Sta. Soil Rpt.* 7 (1913), pp. 46, pls. 2, figs. 7).—This report deals briefly with the physiography, topography, and formation of the soils of the county and more fully with soil material and soil types, chemical composition of the soil, and field tests of the fertilizer requirements of certain of the prevailing types.

McDonough County lies in the upper Illinois glaciation. Its soils are divided into three classes, as follows: (1) Upland prairie soils, rich in organic matter; (2) upland timber soils, including those zones along stream courses over which the forests once extended; and (3) swamp and bottom-land soils, which include the flood plains along streams. The timberlands are divided chiefly into two classes, the undulating and the hilly areas. The common prairie soil known as brown silt loam occupies 55 per cent of the area of the county, while the yellow silt loam of the hilly land is the next most extensive type, covering 25 per cent of the county.

"General statements relating to the total quantities of plant food in the plowed soil . . . emphasize the fact that the supplies of some of these necessary elements of fertility are extremely limited when measured by the needs of large crop yields. . . . The most significant fact revealed by the investigation of the soils of this county is the low phosphorus content of the common brown silt loam prairie."

Chemical analyses of some Kansas soils, C. O. SWANSON (*Kansas Sta. Bul.* 199 (1914), pp. VIII+633-715).—This bulletin discusses the chemical composition of soils in relation to crop production, and reports analyses of type soils from representative areas of the State comprising portions of Allen, Brown, Russell, Finney, Riley, Sedgwick, Butler, Doniphan, and Harper counties, most of which are in areas surveyed and mapped by the Bureau of Soils of this Department. The methods used are described and the results of analyses are discussed with reference to the crop requirements and fertilizer needs of the different types. In some cases an attempt was made to study the depletion

of soil fertility under tillage by examining parallel samples from fields which have been under long cultivation and from adjacent areas kept in grass.

The results of analyses of the surface soils (to a depth of 7 in.) and the subsoils (the layer between 20 and 36 or 40 in.) are given in the following table:

Average results of analyses of soil types of Kansas.

Soil type.	Soil layer.	Nitrogen.	Phosphorus.	Potassium.	Calcium.	Organic carbon.	Inorganic carbon.
		<i>Per cent.</i>	<i>Per cent.</i>	<i>Per cent.</i>	<i>Per cent.</i>	<i>Per cent.</i>	<i>Per cent.</i>
Oswego silt loam.....	Surface soil....	0.220	0.048	1.35	0.67	2.51	
	Subsoil.....	.066	.037	1.42	.48	1.05	
Oswego fine sandy loam..	Surface soil....	.155	.026	.81	.24	1.63	
	Subsoil.....	.058	.022	.93	.23	.46	
Sedgwick clay loam.....	Surface soil....	.217	.043	1.60	.47	2.40	
	Subsoil.....	.101	.031	1.46	.78	.88	
Neosho silt loam.....	Surface soil....	.166	.026	1.32	.39	1.58	Trace.
	Subsoil.....	.062	.015	1.34	.37	.51	Trace.
Yazoo loam.....	Surface soil....	.173	.042	1.83	.53	1.83	
	Subsoil.....	.090	.035	1.90	.52	.89	
Yazoo clay.....	Surface soil....	.269	.059	1.77	.44	2.69	
	Subsoil.....	.109	.027	1.85	.59	1.04	Trace.
Sharkey clay.....	Surface soil....	.267	.058	1.80	.68	2.79	
	Subsoil.....	.070	.032	1.57	.75	.77	Trace.
Marshall silt loam.....	Surface soil....	.221	.053	1.94	.56	2.70	
	Subsoil.....	.082	.055	1.95	.65	.75	
Marshall gravelly loam...	Surface soil....	.247	.037	1.34	.60	2.79	Trace.
	Subsoil.....	.070	.039	1.35	.55	.73	Trace.
Yazoo silt loam.....	Surface soil....	.173	.065	1.84	.70	3.18	
	Subsoil.....	.080	.064	1.92	1.00	1.02	
Sedgwick clay loam.....	Surface soil....	.187	.051	2.04	.84	2.14	
	Subsoil.....	.058	.054	2.00	2.29	.68	
Sedgwick sandy loam.....	Surface soil....	.141	.048	1.80	.74	1.61	
	Subsoil.....	.061	.063	1.91	.72	.63	Trace.
Benton loam.....	Surface soil....	.237	.053	1.62	5.03	2.90	4.501
	Subsoil.....	.073	.063	1.30	8.05	1.28	12.352
Waldo loam.....	Surface soil....	.269	.060	1.90	1.11	3.18	Trace.
	Subsoil.....	.072	.055	2.14	1.99	.76	1.380
Marshall silt loam.....	Surface soil....	.124	.067	2.26	1.17	1.16	
	Subsoil.....	.049	.070	2.12	3.82	.30	
Marshall silt loam (sandy phase).	Surface soil....	.103	.061	2.42	1.08	.94	.133
	Subsoil.....	.040	.056	2.45	1.81	.31	.253
Laurel loam.....	Surface soil....	.168	.069	2.48	1.19	1.52	.960
	Subsoil.....	.053	.010	2.04	4.55	.39	1.123
Laurel sandy loam.....	Surface soil....	.090	.060	2.42	.97	.82	
Finney sandy loam.....	do.....	.074	.038	2.32	2.63	.64	
	Subsoil.....	.051	.028	2.22	1.12	.33	
Dune sand.....	Surface soil....	.017	.036	2.79	.60	.11	Trace.
Colorado sand.....	do.....	.027	.035	2.46	.45	.24	
Rough stony land.....	do.....	.079	.067	2.36	2.86	.64	.703
Colorado adobe.....	do.....	.100	.068	2.51	.81	.97	
	Subsoil.....	.037	.068	2.23	2.30	.19	
Finney clay.....	Surface soil....	.108	.065	2.24	.81	.88	Trace.
	Subsoil.....	.038	.067	2.27	.98	.28	.029
Oswego silt loam.....	Surface soil....	.217	.053	1.82	.68	2.60	
	Subsoil.....	.104	.043	1.96	.83	.57	
Marshall silt loam.....	Surface soil....	.205	.051	2.05	.67	2.02	
	Subsoil.....	.070	.023	1.99	.64	.43	
Wabash silt loam.....	Surface soil....	.188	.055	2.12	.77	2.11	
	Subsoil.....	.073	.091	2.09	.71	.64	
Laurel silt loam.....	Surface soil....	.252	.057	1.95	2.07	2.75	.341
	Subsoil.....	.064	.054	1.94	1.84	.59	1.204
Wabash silt clay.....	Surface soil....	.340	.078	2.16	.44	3.62	4.462
	Subsoil.....	.082	.047	1.95	6.06	.62	6.571
Sedgwick clay loam.....	Surface soil....	.132	.055	1.99	.55	2.51	
	Subsoil.....	.064	.044	2.19	3.87	1.82	
Sedgwick black clay loam.	Surface soil....	.136	.031	1.92	.48	1.56	Trace.
	Subsoil.....	.069	.047	1.93	1.00	.55	.108
Sedgwick loam.....	Surface soil....	.181	.040	2.21	.39	1.97	Trace.
	Subsoil.....	.064	.048	2.12	.59	.74	Trace.
Sedgwick sandy loam.....	Surface soil....	.099	.030	2.32	.63	1.03	Trace.
	Subsoil.....	.069	.029	2.19	.37	.60	Trace.
Derby loam.....	Surface soil....	.152	.050	2.11	.55	1.69	Trace.
	Subsoil.....	.060	.032	2.08	.64	.50	.166
Arkansas loam.....	Surface soil....	.191	.051	2.25	.53	2.04	Trace.
	Subsoil.....	.062	.042	2.24	.55	5.56	Trace.
Miami sand.....	Surface soil....	.041	.040	2.60	.52	.52	.044
	Subsoil.....	.057	.051	2.19	.75	.60	.259
Miami fine sand.....	Surface soil....	.066	.038	2.64	.75	.71	Trace.
	Subsoil.....	.028	.040	2.61	.80	.25	.059
Sedgwick clay loam.....	Surface soil....	.180	.026	1.59	.49	2.19	
	Subsoil.....	.074	.025	1.59	.85	.74	
Clarksville stony loam...	Surface soil....	.167	.025	1.57	.46	2.14	Trace.
	Subsoil.....	.087	.026	1.59	1.38	.78	.349

Average results of analyses of soil types of Kansas—Continued.

Soil type.	Soil layer.	Nitrogen.	Phosphorus.	Potassium.	Calcium.	Organic carbon.	Inorganic carbon.
		<i>Per cent.</i>	<i>Per cent.</i>	<i>Per cent.</i>	<i>Per cent.</i>	<i>Per cent.</i>	<i>Per cent.</i>
Brown fine sandy loam...	Surface soil...	0.192	0.060	2.04	0.53	2.13	.....
	Subsoil.....	.105	.063	1.99	.51	1.37	.....
Dark brown silt loam.....	Surface soil.....	.176	.062	1.80	.52	1.94	.....
	Subsoil.....	.069	.054	1.92	.54	.63	.....
Brown silt loam.....	Surface soil.....	.103	.064	1.73	.54	1.09	.....
	Subsoil.....	.043	.076	1.95	.70	.45	.....
Silt subsoil.....	do.....	.025	.070	2.11	.65	.32	.....
Brown loam.....	Surface soil.....	.091	.035	1.80	.37	.81	.....
	Subsoil.....	.056	.039	1.76	.49	.41	.....
Brown fine sandy loam...	Surface soil.....	.075	.032	2.15	.51	.53	.....
	Subsoil.....	.035	.080	2.12	.51	.21	.....
Brown sandy loam.....	Surface soil.....	.097	.038	1.99	.23	.90	.....
	Subsoil.....	.040	.034	1.97	.54	.30	.....
Coarse sandy loam.....	Surface soil.....	.105	.037	2.05	.39	1.01	.....
	Subsoil.....	.053	.035	2.03	.38	.46	.....
Alluvial loam.....	Surface soil.....	.081	.041	1.96	.22	.70	.....
	Subsoil.....	.044	.038	1.89	.49	.39	.....
Gray silt loam.....	Surface soil.....	.123	.036	1.71	.39	1.38	.....
	Subsoil.....	.061	.036	1.33	.98	.58	.....

Geologic origin and history of the New York State soils, O. D. VON ENGELN (*Cornell Countryman*, 12 (1914), No. 1, pp. 15–20, 58, figs. 2).—This is the first of a series of articles dealing with the agriculture of New York. It is a brief discussion of the general features of the origin and history of the soils of the State, indicating that they are mainly of glacial origin and that their character is largely determined by the composition of the underlying rock. Attention is called to the varied nature of the glacial deposits and to their manner of deposition. The sheet of so-called till is said to be probably the most widespread.

The soils of New York State, H. O. BUCKMAN (*Cornell Countryman*, 12 (1914), No. 1, pp. 21–25, 60, figs. 3).—In this, the second of a series of articles on agriculture in New York, a review of the soil conditions in the State is given which indicates that the soils now represent five groups, the residual, marine, glacial till, glacial lake, and alluvial, the last three of which predominate. It is stated that the general fertility of the soils is directly traceable to their lime content and that their greatest need is drainage. A general soil map and a discussion of the different soil series as they occur are also given.

Soil survey of Bamberg County, South Carolina, W. E. McLENDON (*U. S. Dept. Agr., Advance Sheets Field Operations of the Bureau of Soils*, 1913, pp. 40, fig. 1, map 1).—This survey was issued September 18, 1914. It covers an area of 237,440 acres in the southwestern part of South Carolina, comprising two topographic divisions corresponding in general with what is locally known as the upper pine belt and the lower pine belt. The topography is nearly flat and the drainage poor, with much swamp land. Twenty types of soil are mapped and described. The principal upland soils belong to the Orangeburg, Tifton, Norfolk, and Portsmouth series; the lowland soils to the Swamp, Kalmia, and Myatt series. The soils are generally sandy or sandy loam. Their crop adaptations are discussed.

Fruit soils of the Great Interior Valley, J. W. NELSON (*Mo. Bul. Com. Hort. Cal.*, 3 (1914), No. 9, pp. 343–351).—The author discusses the variety, texture, and composition of soils with reference to fruit culture, emphasizing particularly the adaptability of different soils to the growing of certain fruits. He enumerates the soils more particularly adapted to the growing of deciduous fruits, olives, figs, almonds, prunes, cherries, and pears.

The nitric nitrogen content in the country rock, R. STEWART and W. PETERSON (*Utah Sta. Bul.* 134 (1914), pp. 421–465, fig. 1).—Investigations as to

the origin of the brown "niter spots" or excessive nitrate accumulations occurring here and there in cultivated soils of Utah, Colorado, and Wyoming are reported.

Analyses of samples of the country rock contributing to the formation of the soil, particularly shales and sandstones, showed them frequently to be heavily impregnated with nitrate accumulations and quantities of other alkali salts which were in many cases equal to those occurring in the "niter spots" in cultivated soil. A marked variation was found in the amount of nitrate present, depending on the location in the geological series, the country rock richest in nitrates being* of Cretaceous and Tertiary origin. Uniformly high results were obtained at widely separated sections. The sandstones and shales adjacent to the nonaffected areas were comparatively free from nitrates.

The authors conclude that the nitrate accumulations in the cultivated soils of the affected areas are derived from the nitrate deposits occurring originally in the country rock and predict that "the so-called 'niter spots' may develop and become troublesome in every section where Tertiary and Cretaceous rocks are the chief source in the formation of the soil."

The assimilation of the nitrogen of the air by free living lower organisms in the soil, W. SCHNEIDEWIND (*Kühn Arch.*, 5 (1914), pp. 57-78, figs. 3).—Comparative culture tests of the nitrogen-fixing power of different soil organisms showed that *Azotobacter* is by far the most active of such organisms. In pot experiments it was found that when sugar and straw were allowed to remain for a sufficient length of time in the soil before planting the yield and nitrogen content of plants grown in the soil were greatly increased. If, however, the planting was done soon after the application of these materials there was a decline in yield and nitrogen content. The same results were observed in field experiments.

Ammonifying power of soil-inhabiting fungi, H. C. McLEAN and G. W. WILSON (*Science*, n. ser., 40 (1914), No. 1021, pp. 140-142).—Comparative tests were made by the beaker method of the rate of ammonification of dried blood and cotton-seed meal by various soil bacteria and fungi, the latter including *Zygorhynchus vuilleminii*, *Rhizopus nigricans*, *Monilia sitophila*, and certain species of *Penicillium*, *Alternaria*, *Aspergillus*, *Trichoderma*, and *Mucor*.

There was found to be considerable difference in the ammonifying power of the various fungi. The largest ammonifying efficiency was observed in the case of *Trichoderma*, which showed 90.5 mg. of ammonia nitrogen out of a total of 155 mg. added in organic form in the test containing acid phosphate and 75.2 mg. in the test without addition of acid phosphate. The highest amount of ammonia accumulated in the case of bacteria was with *Bacillus subtilis*, which showed 54.13 mg. of ammonia nitrogen without acid phosphate and 17.55 mg. with 2 per cent of acid phosphate.

The environment of soil bacteria, F. H. H. VAN SUCHTELEN (*Rpt. Mich. Acad. Sci.*, 15 (1913), pp. 65-70).—The investigations upon which this article is based have already been noted from another source (*E. S. R.*, 31, p. 317).

Soil acidity, J. E. HARRIS (*Michigan Sta. Tech. Bul.* 19 (1914), pp. 3-15).—The author reviews various opinions regarding soil acidity, briefly describes some of the more important methods for its determination, and reports experiments with acid upland sand and clay soils, using kaolin in a similar manner for comparison. It is concluded "that the reaction of so-called acid soils of the sandy loam type is one of selective adsorption by the soil of the basic constituents of the neutral salt solution. It is not due to a double decomposition with adsorped acids or insoluble 'humic acids.' . . .

"The 'acidity' of soils of the type investigated probably arises from the formation of soluble salts through the interaction of weak acids ($C_2H_2O_4$; CO_2 ,

etc.) in the soil solution and the basic material naturally held adsorbed by the soil and their subsequent removal by leaching. This leaves the soil free to adsorb more basic material from any source with which it may come in contact.

"Kaolin in its natural condition does not show the power of selective adsorption, but after treatment with acids to remove the adsorbed bases it becomes capable of removing a corresponding quantity of base from a neutral salt solution. The quantity of base adsorbed by a soil or by kaolin varies with different salt solutions, thus rendering unreliable the results of any analytical method for determining the 'lime requirement' of a soil unless the method employs the same material that is to be used in the field."

Soil acidity and methods for its detection, J. E. HARRIS (*Science, n. ser.*, 40 (1914), No. 1031, pp. 491-493).—In view of the results obtained in the investigations noted above the author concludes that methods of determining the lime requirement of soils based upon the old humic acid theory are not reliable. "The only sure way to determine the lime requirement of an acid soil is to use the same material in the test as is used in the field for correcting the acidity," as is done in the methods of Veitch and Süchting, because, as was shown in the investigations referred to, acid soils do not adsorb equivalent amounts of different ions.

Soil denudation by rainfall and drainage and conservation of soil moisture, A. HOWARD (*Indian Tea Assoc., Sci. Dept. Quart. Jour.*, No. 1 (1914), pp. 24-30).—In a brief discussion of the injurious effects of soil erosion in India, proper surface drainage and moisture conservation by cultivation are advocated as remedies.

Coast sand dunes, sand spits, and sand wastes, G. O. CASE (*London, 1914, pp. [XI]+162, pl. 1, figs. 42*).—The object of this book "is more particularly to draw attention to the advantages of collecting the inblown sand in the formation of a large coast protection dune, which when built up by the wind, under the guidance of man, to a proper height and inclination . . . prevents inland sand drift and the formation of sand wastes, . . . acts as an embankment or line of defense against erosion of the coast, . . . and enables, and makes it commercially worth while, to reclaim and convert into . . . pine woods any existing inland areas of sand wastes or useless belts of sand dunes only partially covered by vegetation."

Data are quoted which state that the sand dunes of Europe, including the sand wastes, cover an area of 13,440,000 acres. The subject matter is presented under the following chapters: Transportation of sand by wind action and formation of coast dunes, sand dunes in Great Britain and abroad, devastation caused by the inland movement of sand dunes, erosion of the coast resulting from the inland movement of sand dunes, formation of sand spits and sand islands, the reclamation of tidal lands by the formation of successive ridges of sand dunes, the formation of a littoral or coast protection dune, protective works on the sea face of littoral dunes, and the reclamation of sand wastes. See also a previous note (E. S. R., 30, p. 239).

Reclamation of waste land, A. D. HALL (*Jour. Roy. Soc. Arts*, 62 (1914), No. 3222, pp. 833-840; *Pop. Sci. Mo.*, 85 (1914), No. 4, pp. 377-391).—The author discusses factors making for soil fertility or the reverse, such as rainfall, drainage, alkalinity, acidity, and lime. Different classes of waste lands are dealt with, but special emphasis is placed upon the reclamation of dry lands, moor and heath lands, and sandy lands. Lime is considered to be the most important factor to be taken into account in rendering waste lands productive, but other methods of fertilizing and improving such lands, especially moor and heath lands, are discussed.

[Reclaiming land injured by volcanic ash], C. C. GEORGESON (*Alaska Stas. Rpt. 1913, pp. 21, 22*).—Land at the Kodiak Station covered with volcanic ash from the eruption of Katmai in 1912 was brought under successful cultivation again by deep plowing to mix the underlying soil with the ash, the application of fertilizers supplying especially nitrogen, which was lacking in the ash, and the use of organic manures to supply humus.

The improvement of marsh soils, A. R. WHITSON, W. W. WEIR, and H. W. ULLSPERGER (*Wisconsin Sta. Bul. 205, 2. ed. (1914), pp. 28, figs. 12*).—A second edition of the bulletin previously noted (E. S. R., 25, p. 20).

The effect of different fertilizers on the chemical and physical properties of soil, A. MAUSBERG (*Illus. Landw. Ztg., 34 (1914), No. 55, pp. 521-523*).—The substance of this article was contained in a previous report (E. S. R., 30, p. 219).

The maintenance of fertility.—Liming the land, C. E. THORNE (*Ohio Sta. Bul. 279 (1914), pp. 22*).—This bulletin reports later results of experiments on the use of lime in a 5-year rotation of corn, oats, wheat, clover, and timothy described in an earlier bulletin of the station (E. S. R., 16, p. 1061).

The experiments were made on a light, silty clay which had previously been subjected to an exhaustive system of farming. Quicklime which had been used (at the rate of 1 ton per acre) in the earlier experiments was subsequently replaced by moderate applications (1 to 2 tons per acre) of ground limestone. The lime was applied to the corn, and various combinations of fertilizers were applied to the cereals, but not to the clover and timothy.

The results show that liming has added materially to the yield of corn under every treatment and on the untreated land. The lowest gain from liming was obtained on the plat receiving phosphorus in basic slag, and the highest gains were on the plats receiving nitrogen in oil meal, dried blood, and ammonium sulphate. Without lime these carriers of nitrogen produced less total corn than did sodium nitrate, but with lime they surpassed the nitrate in increasing the yield. Wherever sodium nitrate was used it increased the total yield and reduced the demand for lime, but in no amount applied did it entirely obviate the necessity for liming.

With oats the results of liming were much less pronounced than with corn. The greatest increase from liming was found on the plat receiving nitrogen in ammonium sulphate. On several of the high nitrogen plats there was an actual decrease in yield after liming.

The wheat crop responded in all cases to lime except on the plat receiving phosphorus in basic slag. The largest increase from liming was on the plat receiving nitrogen in ammonium sulphate.

Clover made a greater response to liming than any other crop. The beneficial effect of sodium nitrate as contrasted with the other nitrogen carriers used was more marked with clover than with any of the other crops. It is suggested that a part of the superior effect of this material with clover, as with corn, on the acid soil used in these experiments was due to the sodium, but that "neither nitrate of soda nor bone meal nor basic slag nor any practicable combination of these materials will furnish sufficient alkali to neutralize this acid soil, unless used in such quantity that the cost will be prohibitive."

The total gain in yield of the timothy crop due to liming was greater, and the percentage gain nearly as great, as in the case of clover, and was much greater than with the oats or wheat. As with clover, the timothy crop did not respond on unlimed soil to applications of organic and ammonia nitrogen, but showed a somewhat greater response than clover to these carriers of nitrogen when lime was added.

The results in general show that lime produces its full effect only when used in connection with liberal manuring or fertilizing.

The bulletin also discusses different forms of lime and gives instructions as to the liming of different crops.

The relative effect of lime as oxid and carbonate on certain soils, H. B. HUTCHINSON and K. MACLENNAN (*Jour. Agr. Sci. [England]*, 6 (1914), No. 3, pp. 302-322, pls. 2, figs. 2; *abst. in Jour. Soc. Chem. Indus.*, 33 (1914), No. 21, pp. 1065, 1066; *Chem. Abs.*, 8 (1914), No. 23, p. 3834).—In a continuation on broader lines of previous work (E. S. R., 29, p. 730) it was attempted to determine the amount of lime required to induce partial sterilization and the relative values of, and the character of the changes produced by, calcium oxid and carbonate in acid and other soils.

In laboratory studies with soils of widely different types the amount of caustic lime necessary to induce specific changes in the flora and fauna of the soil was found to depend very largely on the character of the soil. Light sandy soil, poor in organic matter and in carbonate, reacted sharply with from 0.2 to 0.3 per cent of caustic lime; a clay soil, poor in organic matter but rich in carbonate, reacted with from 0.3 to 0.4 per cent; an acid soil required an amount between 0.5 and 1 per cent, as did also a rich garden soil which already contained carbonate; a soil with a high organic and low carbonate content failed to react even with applications of 1 per cent of caustic lime. "Each of these soils, as well as many others examined, appears to absorb directly a definite amount of caustic lime, and until these requirements are fully satisfied the partial sterilization phenomena do not set in." Smaller applications than those required for partial sterilization induced a temporary suspension of nitrification, and consequent accumulation of ammonia, for periods varying with the amount of lime and the character of each soil, and also led to a temporary increase in the numbers of bacteria.

"Caustic lime chemically breaks down some of the organic matter of the soil, as shown by the ammonia formed during periods when soil bacteria are quiescent; when, however, bacterial growth commences there is a large increase in the rate of ammonia production. The return in nitrogen, as ammonia and nitrate, for each increment of lime applied varies with the character and reaction of the soil and the carbonate content. . . . Carbonate gave less returns, apparently because of its relative inaction on soil organic matter."

Pot experiments showed amounts of available nitrogen in the soils comparable with the amounts of ammonia and nitrate produced in the laboratory experiments. In some cases the amount of caustic lime applied was sufficiently large to check the growth of bacteria and to depress plant growth in the first crop, but in the case of a rich garden soil the bacteria were active although plant growth was depressed.

Inhibition of nitrification resulting from applications of lime was found to lead to a higher nitrogen content in the plants. Where the amount of lime did not check nitrification the nitrogen content of the plants was about normal.

A bibliography of the subject is appended.

New fertilizer materials and by-products, H. D. HASKINS (*Massachusetts Sta. Bul.* 155 (1914), pp. 173-181).—Analyses of the following materials are reported with notes on their value and use as fertilizers: Sheep manure and wool waste, wool waste feed from grease (sud cake), fine-ground foreign whale guano, rockweed, crude unground garbage tankage, calcined phosphate, calcium cyanamid, garbage tankage, picker dirt from cotton mill, cocoa-shell dust, shoddy dirt from woolen mill, lime refuse from manufacture of lactic acid, lime refuse from a bleachery filter bed, and lime refuse from a tannery.

The synthetic production of ammonia, F. HABER (*Ztschr. Angew. Chem.*, 27 (1914), No. 62, Aufsatzteil, pp. 473-477).—The author briefly reviews his investigations on electrical synthesis of ammonia.

AGRICULTURAL BOTANY.

A manual of bacteriology, H. S. REED (*Boston, New York, Chicago, and London, 1914, pp. XII+179, pls. 2, figs. 46*).—This book, in which the author has outlined many experiments calling for the simplest kind of equipment which should acquaint the student with the fundamental facts concerning bacteria, is intended for agricultural and general science students. In addition to the outline for the study of bacteria a section has been added on the study of important fermentations caused principally by fungi.

Various appendixes are given in which are presented new as well as well-known methods applicable to biological work and the descriptive chart of the Society of American Bacteriologists.

Classification of nodule bacteria, M. KLIMMER and R. KRÜGER (*Centbl. Bakt. [etc.]*, 2. Abt., 40 (1914), No. 11-13, pp. 256-265).—Details are given regarding the authors' study of nodule bacteria from 18 different Leguminosæ, which are claimed to fall into 9 sharply defined species. These include *Bacillus radicicola* in *Melilotus alba*, *Medicago lupulina*, *M. sativa* and *Trigonella fœnum græcum*, also one form pertaining to each of the groups *Lupinus perennis*, *L. luteus*, *L. angustifolius*, and *Ornithopus sativus*; *Lotus uliginosus*, *Anthyllis vulneraria*, and *Tetragonolobus purpureus*; *Vicia sativa* and *Pisum arvense*; *V. faba*; *Trifolium pratense*; *Phaseolus vulgaris*; *Soja hispida*; and *Onobrychis sativa*.

A morphological and cultural study of some *Azotobacter*, D. H. JONES (*Proc. and Trans. Roy. Soc. Canada*, 3. ser., 7 (1913), Sect. IV, pp. 43-55, pls. 5).—This is an account of studies made on six samples of soil at the Ontario Agricultural College in November, 1910, these samples including cultivated loam, sandy gravelly subsoil 18 and 30 in. deep, old or new compost, and road sand washings. These studies were made on flask and plate cultures regarding temperature and atmospheric relations, pigment production, etc., results being detailed so far as obtained up to this time.

The influence of calcium on soil bacteria, F. MILLER (*Ztschr. Gärungsphysiol.*, 4 (1914), No. 3, pp. 194-206).—The author describes a series of studies on the influence of calcium in varying proportions on soils.

It was found that the addition of 0.3, 0.5, and 1 per cent of calcium oxid to clayey soil first checked sharply and later increased markedly the development numerically of bacteria (which was, however, entirely inhibited by 5 per cent calcium oxid). Simultaneous application of calcium oxid and dextrose gave a greater increase of bacteria, and also more quickly overcame the inhibition due to heavy additions of calcium oxid. Different species of bacteria gave different responses to the addition of calcium oxid. When 0.1 per cent calcium oxid was added to sterile earth eight days previous to inoculation it was found to exert a slight stimulative influence, while 0.5 per cent calcium oxid lost quickly its inhibitive influence. Limy clay soil showed a decrease instead of an increase of denitrification after the addition of more than 0.05 per cent calcium oxid, but red sandstone poor in lime showed a stimulative response in this respect on the addition of from 0.01 to 0.06 per cent calcium oxid.

Bacteria of frozen soil, H. J. CONN (*New York State Sta. Tech. Bul.* 35 (1914), pp. 20, figs. 4).—A report is given of experiments conducted to determine whether the increase in numbers of bacteria in frozen soils may be due

to a rise of the organisms from lower depths, or whether the low temperature or high moisture content of winter soil favor bacteria.

In the experiments with aerated and unaerated soils in pots, tests were made of two types of soil that had been cropped recently. It was found that the number of bacteria in frozen soil is generally larger than in unfrozen soil. The increase after freezing is not due to an increase in soil moisture, and it took place in potted soil where there was no possibility that the bacteria could be brought up from lower depths.

Discussing the general results, the author offers a number of explanations, among them a dependence on low temperature rather than increase in soil moisture. Also the increase may not be an actual multiplication, but a liberation of a large number of colonies that would not be otherwise recognized. If the increase is due to actual multiplication it might imply that soil organisms are able to use congealed water in their physical activities. Another possibility is that of the effect of cold on protozoa in their relation to bacteria. The influence of the increase of bacteria in frozen soils on fertility is unknown.

Radio-activity and vegetation, G. TRUFFAUT (*Jardinage*, 1914, May; noted in *Gard. Chron.*, 3. ser., 55 (1914), No. 1431, pp. 378, 379; *Agr. News* [*Barbados*], 13 (1914), No. 318, p. 215).—In a series of experiments with leguminous and other plants in soils containing radium bromid as the radio-active manure, but also rich in nitrogen and other mineral fertilizers, a progressive decrease of yield corresponded to a higher content of the radio-active substance. It appeared in some cases, however, that as the nitrogen was used up in the soil the later crops showed an increase thought to be due to the radio-active factor under these conditions.

In a second series of experiments, carried out with chrysanthemums in pots, the relative values of different radio-active substances were investigated. It was concluded that radio-active substances produce a definite effect on vegetation, the insoluble not less than the soluble forms, radio-active minerals or oxids giving the best results; that black oxid of uranium is practicable, giving good results at low cost; but that radio-active residues of commercial manufactures may contain injurious quantities of such poisonous substances as salts of barium or sulphuric acid.

Experiments with spinach in the field gave no well-marked results.

A summer's record of evaporation and precipitation in Lancaster County, Pennsylvania, CAROLINE RUMBOLD (*Plant World*, 17 (1914), No. 7, pp. 213-215).—The author gives detailed records of observations regarding rainfall and evaporation in a chestnut orchard in eastern Pennsylvania, covering the time during foliation, lasting about six months. These climatic conditions are considered as nearly the optimum for deciduous trees of the temperate zone, especially for the chestnut tree.

Specialization in vegetation and in environment in California, W. A. CANNON (*Plant World*, 17 (1914), No. 8, pp. 223-237, figs. 3).—The results of this examination of the surface, climate, and flora of California may be summarized in a general statement that there exists a conformity or association between the last mentioned and the other two, the flora being extremely diverse and highly specialized, showing not only response by species but sometimes also by individuals. No particular attempt has been made to trace a causal relation between any special environment and response thereto. Relation often appears to be more accidental than otherwise, as in case of the Big Trees. However, some suggestions regarding relationships are made.

On the density of the cell sap in some desert plants, W. A. CANNON (*Plant World*, 17 (1914), No. 7, pp. 209-212).—A study was made of *Opuntia discata*,

a succulent desert species, *Fouquieria splendens*, a nonsucculent, and *Peganum harmala*, a half shrub with perennial subterranean parts, presenting rather the appearance of a mesophyte than of a successful desert perennial. All of these were grown for experimental purposes in the glass house of the Desert Laboratory at Tucson, Ariz.

Leaf epidermis of the first and second species showed complete plasmolysis within 10 minutes in 0.5 normal solution of potassium nitrate. That from *P. harmala* showed slow plasmolysis in the same solution, but none in one of lower concentration. The root epidermis required a strength of about 0.75 normal. Later tests with this plant gave very different results, although no explanation is offered.

Results obtained with *O. discata* are said to agree fairly well with those obtained by Livingston (E. S. R., 18, p. 328), while those with *P. harmala* are said to show a somewhat less dense cell sap than Fitting (E. S. R., 25, p. 430) found for the same species at Biskra. The range of experiments with *F. splendens* was limited by the supply of material on hand.

On the influence of the order of development of the fruits of *Passiflora gracilis* upon the frequency of teratological variations, J. A. HARRIS and R. A. GORTNER (*Plant World*, 17 (1914), No. 7, pp. 199-203).—A study of a rather large series of data obtained with *P. gracilis*, grown in ordinary soil and in soil to which bone meal was added, is said to show that in both classes of substrata the proportion of abnormalities in mature or immature fruits decreases as the plant becomes older.

Inheritance of leaf coloration in *Melandrium*, G. H. SHULL (*Ber. Deut. Bot. Gesell.*, 31 (1913), *Gen. Versamml. Heft*, pp. (40)-(80), *pl. 1, figs. 2*).—Giving in considerable detail the results of studies as carried out with *Melandrium*, the author states that he has confirmed the claim of Baur (E. S. R., 25, p. 771) regarding the existence of an inheritance factor for the formation of chlorophyll, in the absence of which the young plant does not form chlorophyll and dies in the seedling stage. Three separate cases of leaf coloration are described which do not conform to the Mendelian formula, and their character inheritance is intended to form the substance of a further report.

A bibliography is appended.

Immunity of plants to their own poisons, G. D'IPPOLITO (*Staz. Sper. Agr. Ital.*, 46 (1913), No. 6, pp. 393-414).—Tests were made involving leaves, petioles, etc., of *Feniculum officinale*, *Conium maculatum*, *Ranunculus velutinus*, and *Delphinium staphysagria* subjected to the action of alkaloids, etc., from their own or each other's juices, or made up into aqueous solutions. The results are detailed and tabulated.

The cells were usually killed in from 6 to 48 hours, but it is thought that chemical changes may have interfered with and masked the processes normally to be expected. A bibliography is appended.

The antitoxic action of chloral hydrate upon copper sulphate for *Pisum sativum*, R. P. HIBBARD (*Rpt. Mich. Acad. Sci.*, 15 (1913), pp. 130-137, *fig. 1*).—This has already been noted from another source (E. S. R., 30, p. 728).

FIELD CROPS.

Summary of [field crops experiments in Alaska], C. C. GEORGESON (*Alaska Stas. Rpt. 1913*, pp. 10, 11, 13-15, 17-19).—In these pages methods of letting the potatoes sprout before planting to get earlier maturity are described, as well as 48 varieties of potatoes grown at the Sitka Station. It is stated that at the Fairbanks Station crops were greatly injured by an August freeze, only the very

earliest having matured. It has been demonstrated that potatoes can be grown at Fairbanks Station at a handsome profit.

At the Rampart Station the production of seeds of *Medicago sativa*, *M. falcata*, *Trifolium lupinaster*, and of turnips are noted, and the successful hybridization of wheat, oats, and barley for improved varieties. *Bromus inermis* is mentioned as a valuable hay and pasture grass for the interior.

Report of [field crops] work at Fairbanks Station, J. W. NEAL (*Alaska Stas. Rpt. 1913, pp. 27-33, pls. 3*).—In this report a trial of cereals is mentioned in which the Romanow spring wheat seemed the most successful of wheats. A hybrid barley No. 4a-1 from the Rampart Station is noted as a promising barley. Sixty-Day oats are noted as a desirable variety for that section. It is noted that late seedings of spring cereals made from 25 per cent to 40 per cent more straw than early seedings. For winter cereals early seeding is noted as being the most successful. A good growth of alfalfa and red clover is noted.

A test of 16 varieties of potatoes showed Gold Coin, Eureka, and Irish Cobbler to be the heaviest yielders. Level cultivation gave a better yield than ridging, presumably because of the protracted drought.

Report of [field crops] work at Rampart Station, G. W. GASSER (*Alaska Stas. Rpt. 1913, pp. 38-46, pls. 3*).—In this report a general survey of the work is given in which are noted the clearing of new land at the cost of \$134 per acre, the beneficial effect of summer and winter fallow, the behavior of 14 varieties of alfalfa, and trials of red, alsike, white, and sweet clovers. The earliest variety of barley matured in 71 days and the earliest oat variety in 81 days. Red Fife and Saskatchewan spring wheats and their hybrids proved to be the best adapted to the climatic conditions, although they did not fully mature all their kernels.

Report of [field crops] work at Kodiak Station, M. D. SNODGRASS (*Alaska Stas. Rpt. 1913, pp. 49-59, pls. 4*).—This report reviews the field work in general, including the preparation of soil covered from 6 to 20 in. with volcanic ash and the production of oats, rye, grass, barley, spring vetch, rape, turnips, ruta-bagas, and sand spurry. In tests of bluegrass, creeping bent grass, rye grass, sheep fescue, meadow fescue, red fescue, redbtop, timothy, and white, red, and alsike clovers, "from the growth of the grasses for this first season the creeping bent grass seemed to lead all other varieties, both on the ash plats and on those manured and given a dressing of nitrate of lime. Closely following this was the meadow fescue, redbtop, and timothy. The stand was poor with both the rye grass and the red fescue, but these two varieties stood better than the other grasses. All varieties showed the effect of a lack of nitrogen in the ash." There was a marked benefit from nitrate of lime on oats on the ash land, and some advantages from the use of superphosphate.

Experiments in the production of crops on alkali land on the Huntley reclamation project, Montana, D. HANSEN (*U. S. Dept. Agr. Bul. 135 (1914), pp. 19, figs. 7*).—In trials of several methods to reduce the salt (principally sulphates of sodium, calcium, and magnesium) content of the soil so that agricultural crops could be grown, the plowing under of rye as a green manure gave prompt relief. During the first season the salt content in the first foot of soil was reduced from 1.16 to 0.32 per cent of the air-dried soil. Subsoiling in addition to turning under the rye reduced the salt content somewhat, but did not influence the yield of succeeding crops.

Experiments with crops under fall irrigation at the Scottsbluff reclamation project experiment farm, F. KNORR (*U. S. Dept. Agr. Bul. 133 (1914), pp. 17, figs. 5*).—This bulletin gives results of experiments at this farm at

Scottsbluff, Nebr., in fall irrigations begun in 1910. Three years' results have been obtained with wheat, oats, and barley, and two years' results with potatoes, sugar beets, and corn.

"With very few exceptions, higher yields of each crop were obtained each year from the land which was fall irrigated than from adjacent land which was not fall irrigated. Considering the average results of three years, fall irrigation increased the yield of wheat 19 per cent, of barley 23 per cent, and of oats 15 per cent. In the average results of two years, fall irrigation increased the yield of corn 22 per cent, of sugar beets 15 per cent, and of potatoes 2 per cent. The average increase in the yield of the six crops on fall-irrigated land was 16 per cent. With the exception of potatoes, the yields of all the crops were increased by fall irrigation sufficiently to more than pay for the cost of the fall irrigation.

"Soil-moisture studies made on the wheat plats in 1911 showed that the fall-irrigated land contained more soil moisture to a depth of 6 ft. throughout the season than the land not fall irrigated. The greatest differences in soil moisture were found in the lower depths of soil, particularly the sixth foot, which contained from 3 to 9 per cent more moisture on the fall-irrigated land than on the land not fall irrigated.

"The difference in soil-moisture content during the growing season appears to have been due to the fact that the land which was not fall irrigated was comparatively dry at planting time in the spring, and that it consequently absorbed water less readily than the fall-irrigated land, which was well supplied with moisture at the beginning of the season."

[Field crop experiments], G. R. ALLAN, D. CLOUSTON, and G. EVANS (*Rpt. Agr. Stas. Cent. Prov. and Berar [India], 1912-13, pp. 15-32, 51-103, 125-143, 147-157*).—This continues previous reports of work on manurial, variety, and rotation trials with cotton, cereals, legumes, and other crops that are being conducted at the various local experiment stations (E. S. R., 29, p. 736).

Report on variety tests, 1913, F. MERKEL (*Arb. Deut. Landw. Gesell., No. 256 (1913), pp. XIII+405+8, pls. 4*).—This publication gives data on about 300 variety tests, including oats, spring wheat, field beans, field peas, stock beets, and sugar beets, conducted throughout Germany.

The cultivated root-producing aroids.—Yautias, gabis, dasheens, aloccasias, and cyrtospermums, F. A. QUISUMBING (*Philippine Agr. and Forester, 3 (1914), No. 4, pp. 85-98*).—This article gives a history of this class of plants and also includes analyses of numerous varieties grown at the college. Starch ranged from 11.51 to 20.38 per cent, ash from 0.42 to 2.25 per cent, and moisture from 66.1 to 80.56 per cent. Yields of yautias ranged from 4,259 to 28,531 lbs. of tubers per acre, dasheens from 5,324 to 22,254 lbs. per acre, and gabis from 2,129 to 10,009 lbs. per acre. Notes on culture, grading, and diseases are also given.

Industrial fiber plants of the Philippines.—A description of the chief industrial fiber plants of the Philippines, their distribution, method of preparation, and uses, T. MULLER (*[Philippine] Bur. Ed. Bul. 49 (1913), pp. 157, pls. 43*).—This bulletin treats of about 750 plants classed under ferns, pandans, grasses, the bamboos, sedges and similar plants, palms, rattans, vines, plants with leaf or petiole fibers of commercial value, miscellaneous industrial fibers, and Philippine bast fibers. Aside from the common and botanical names, the author has given descriptive methods of preparing the fiber and its uses for each plant, and in some cases its distribution.

A list of grasses from Ahmadabad and Surat, L. J. SEDGWICK (*Jour. Bombay Nat. Hist. Soc., 23 (1914), No. 1, pp. 110-117*).—This list includes notes

on the habitats, ecological relations, and time of flowering of 34 uncultivated grasses.

Culture of meadows on moor soils, M. OEHME (*Wiesenbau auf Moorboden. Berlin, 1913, 3. ed., pp. 48, figs. 9.*).—This book treats of the possibilities of both high and low moorlands, and includes discussions on regulating the ground water, the preparation of the seed bed, fertilizers, seeding, and management.

Moisture as a factor of error in determining forage yields, R. McKEE (*Jour. Amer. Soc. Agron., 6 (1914), No. 3, pp. 113-117.*).—From work done in 1911, 1912, and 1913 on varieties of alfalfa at Chico, Cal., the author concludes that available data relative to forage yields can be made more accurate by determining both water-free substance and air-dry matter from at least a 2-lb. sample from the field-cured crop.

Commercial Turkestan alfalfa seed, E. BROWN (*U. S. Dept. Agr. Bul. 138 (1914), pp. 7, fig. 1.*).—Following a review of European and American literature on results of experimental work with alfalfa from various localities, the author concludes that although Russian Turkestan produces the largest supply of alfalfa seed for export, and supplies practically all of the imported seed in this country, being distributed into international trade through Germany, chiefly through the port of Hamburg, it "has given uniformly poor results wherever tested in Europe, and none of the tests of commercial Turkestan seed in this country has given as good yields as were obtained from local seed. . . .

"Commercial Turkestan is the cheapest alfalfa seed in the European market, and its wholesale price in this country is less than that of domestic-grown seed. The retail price of Turkestan alfalfa seed in this country is usually higher than that of domestic seed; consequently, the seedsman's profit on it is greater than on domestic seed.

"Commercial Turkestan alfalfa is particularly unsuited to the humid eastern portion of the United States, while it is not as hardy as other strains in the North and everywhere recovers slowly after cutting, thus reducing the hay yield. It is relatively short lived and is a poor seed producer.

"Russian knapweed, a weed similar in manner of growth to quack grass, Johnson grass, and the Canada thistle, is constantly being introduced in Turkestan alfalfa seed, and by the presence of this weed seed commercial Turkestan seed may be easily identified."

A bibliography of 12 titles is appended.

Some distinctions in our cultivated barleys with reference to their use in plant breeding, H. V. HARLAN (*U. S. Dept. Agr. Bul. 137 (1914), pp. 38, figs. 16.*).—In order to facilitate his work of breeding barley the author found it necessary to study more minutely the characters of barley, and so to increase the efficiency of the nursery by elimination. "The data upon which the conclusions are based consist of some 200,000 recorded observations extending over a period of five seasons and embracing experiments at St. Paul, Minn., Williston and Dickinson, N. Dak., Highmore, S. Dak., Moccasin, Mont., Aberdeen and Gooding, Idaho, and Chico, Cal. Of the work done at these points, that at St. Paul, Minn., which was conducted in cooperation with the state experiment station, was the most extensive."

The following summary of conclusions covers the characters studied and expresses their value to the plant breeder: "Strains are often shown to be distinct in early growth by their rate of development. All barleys rush through the early stages very rapidly, and a selection that is one or two days earlier than a second is very dissimilar in appearance on a given date. Leaf production is, in some ways, a varietal character. In some varieties the third leaf appears in three days after the second, while in others it occurs six days later. In the production of the fourth leaf even a greater range exists. In some

strains the first tiller appears decidedly later than the fourth leaf. In others it appears earlier. In some the tillers are all produced within a short time; in others the process is extended over several days.

"The emergence of the awn is an extremely important note, as it occurs at a time in the life of the plant when such an observation is of great value. The development is usually normal at this time, as hot weather and drought have ordinarily not yet had any effect. The emergence of the awn has been found to be far more accurate and more easily obtained than the date of heading. The precocity of the strain at the time of the emergence of the awn is a heritable character. The date of ripening is, unfortunately, often influenced by season and, while a valuable character, is less dependable than the emergence of the awns. A comparison of the development during all stages serves to reveal many differences not apparent when each stage is taken separately.

"The length of the culm is of use as a local breeding note, but the variations are not parallel when strains are planted in totally different areas. The diameter of the culm is not serviceable, because nearly related barleys have culms of approximately the same size. The thickness of the walls of the culm is a note with a large experimental error and therefore of questionable utility. The degree of exsertion of the spike is sometimes a varietal character but is not often useful. The number of culms per plant is to some extent a varietal character, but selections are so affected by season and location that it is very difficult to use. The width of the leaves is useful in group distinctions and sometimes in varietal separations. The length of the leaves is much less dependable, and is serviceable only in rather extreme types. The number of leaves varies with the groups, but usually closely related strains possess approximately the same number of leaves.

"The density of the spike may easily be made the basis of many separations. Often varieties that show no other differences are widely dissimilar in density. The density of a selection varies somewhat with season and location, but the mean is always sharply defined and the fluctuations more or less parallel. In some strains all spikes conform closely to the mean, in others the range is greater. This seems to be a varietal character and is constant even when the plantings are made under widely varying climatic and soil conditions.

"The established taxonomic groups based on relative fertility were found to be invariable under all extremes of American climate. The natural varieties in the *deficiens* group of Abyssinian barleys seem more extensive than most classifications have indicated. From barleys of this same region a group with a peculiar habit of floret abortion has been isolated. The length and the width of awns vary, but they are so correlated with other taxonomic characters that they are seldom useful in close separations. The tenacity of the awn is frequently a varietal character unaffected by location or season. The character of the basal bristle has been found to be stable under American conditions. The toothling of the inner part of dorsal nerves is much more variable, but the variation is usually within definable limits. The length of the kernel, while influenced by climate, is a varietal character. The lateral and dorsoventral diameters of the kernel are varietal characters to some degree, but they are so influenced by conditions of growth as to become confusing in most instances. The composition of the grain is a varietal character, but it is one dominated by climate.

"There are two coloring materials in barley: One, anthocyanin, is red in its acid and blue in its alkaline condition. The other, a melaninlike compound, is black. The pigments may occur in the hulls, the pericarp, the aleurone layer, and occasionally in the starch endosperm. The resulting colors of the grain are quite complicated. White denotes the absence of all pigment, a heavy de-

posit of the melaninlike compound in the hulls results in black, a light deposit, brown. Anthocyanin in the hulls results in a light violet red. In naked forms the melaninlike compound in the pericarp results in a black kernel; anthocyanin produces a violet one. The acid condition of anthocyanin in the pericarp superimposed upon the alkaline condition in the aleurone layer gives the effect of a purple color, while a blue aleurone beneath a colorless pericarp is blue gray. White hulls over a blue aleurone cause the grain to appear bluish or bluish gray. Black hulls over a blue aleurone give, of course, a black appearance. The anthocyanin is always violet in the hulls and in the pericarp, showing that these tissues are in an acid condition, and always blue in the aleurone layer, showing an alkaline condition. The occurrence of anthocyanin in the pericarp of hull-less barleys is more significant than its production in the aleurone layer."

A bibliography of 26 titles is appended.

[Analyses of locally grown cassava], J. S. CAMUS (*Philippine Agr. and Forester*, 3 (1914), No. 4, p. 75).—The analyses of white petioled, red petioled, and intermediate varieties of cassava showed a range of starch content from 23.82 to 25.79 per cent, mere traces of sugar and dextrin, from 0.043 to 0.048 per cent of hydrocyanic acid in the bark, and from 0.023 to 0.028 per cent in the edible portion. The latter is expelled by cooking.

Some principles of genetics applied to cotton production, L. TRABUT (*Gouv't. Gén. Algérie, Dir. Agr., Serv. Bot. Bul. 50* (1912), pp. 16).—This discusses recent work at the leading cotton-breeding stations of the world.

Kafir, G. K. HELDER (*Kansas Sta. Bul. 198* (1914), pp. 609-627, figs. 7).—In this bulletin the author has attempted to show briefly the value of Kafir corn in the western half of Kansas and particularly in upland soils, giving a discussion of the varieties best adapted for each locality and the most economical methods of handling them.

A summary states that in western Kansas Kafir corn is worth twice as much, acre for acre, as corn; that listing is more satisfactory than surface planting; that row plantings are more economical than broadcast plantings; that cutting with a binder is the most economical method of harvesting row plantings; that the silo offers the cheapest and most convenient method of storing Kafir corn fodder for cattle feeding; that threshed grain stored in bins will heat unless it is clean and very dry; that home-grown seed is usually superior to imported seed; that seed selection should be made in the field in the fall before the first hard frost; that Kafir corn to be used as seed should not be threshed until planting time; that the formalin treatment effectually kills kernel smut; and that Kafir corn compares favorably with corn either as fodder, grain, or silage.

Relation of yield of straw and grain in oats, H. H. LOVE (*Jour. Amer. Soc. Agron.*, 6 (1914), No. 3, pp. 97-108, figs. 7).—In this article the author discusses the relation of yield of straw and grain in the 31 varieties grown at Cornell University in 1911, 1912, and 1913. Data presented show the ratio of pounds of straw to pounds of grain to range from 1.08:1 to 3.11:1 in 1911, 1.12:1 to 2.03:1 in 1912, and 1.04:1 to 2.05:1 in 1913.

"The foregoing data show that there is a very close relationship between yield of grain and yield of straw for the different varieties and that this is fairly constant from year to year and is not merely an environmental relation. Certain exceptions occur, but, on the whole, one may expect an increase in yield of grain with a corresponding increase in yield of straw. The ratio of straw to grain is also shown to be fairly constant from year to year. Certain strains produced almost a pound of grain for every pound of straw, while others

required nearly 2 lbs. of straw to produce a pound of grain. While a heavy yield of straw was found to be correlated with a heavy yield of grain it was, in turn, correlated with a small amount of meat."

Report of the potato cultural experiments for 1912, F. TOCH (*Arb. Deut. Sek. Landeskult. Rat. Königr. Böhmen*, No. 16 (1912), pp. 48, pl. 1).—This gives data and results of variety tests of potatoes throughout Bohemia under the direction of the German section of the agricultural commission of Bohemia.

The cultivation of rice in Spain, A. TARCHETTI (*Gior. Riscolt.*, 4 (1914), Nos. 15, pp. 220, 221, fig. 1; 16, pp. 237-243, figs. 6).—This describes systems and improved methods.

Field experiments covering 1913, A. W. K. DE JONG (*Dept. Landb., Nijv. en Handel [Dutch East Indies], Meded. Agr. Chem. Lab.*, No. 7 (1913), pp. 49, figs. 3).—This publication gives results of experiments conducted in 1913 that show the advantage of plowing under peanuts (*Arachis hypogea*) as a green manure for rice, and that a complete fertilizer was more satisfactory than a nitrogenous fertilizer.

On the weight and sugar content of sugar beets in relation to the area at the disposition of each plant in the field, H. PELLET (*Sucr. Indig. et Colon.*, 84 (1914), Nos. 3, pp. 59-61; 4, pp. 84-88, fig. 1; 5, pp. 104-108).—A French translation of an article by Munerati et al. previously noted (*E. S. R.*, 31, p. 633).

Determination of ripeness in Pundia cane, R. G. PADHYE (*Poona Agr. Col. Mag.*, 6 (1914), No. 1, pp. 71-75).—From the results of cutting and analyzing cane at different dates it was found "that the sucrose percentage was regularly increasing every week till the cane was 12 months old and the glucose and fructose were decreasing. The purity was rising till it reached 92, after which it began to fall. Thus this cane was found to be ripe exactly after 12 months. When the purity was found to fall, cutting was immediately begun. . . . It has been found that the juice crushed in the laboratory mill is richer than that of the power crusher, where the extraction is high, and consequently more impurities are extracted. . . . In the juice of the perfectly ripe cane little fructose seems to occur."

Growing sugar cane for market, S. R. PARANJPYE (*Poona Agr. Col. Mag.*, 5 (1914), No. 3, pp. 197-200, pl. 1, fig. 1).—This describes the methods of growing soft, thick, white sugar cane for the Bombay market. The yield is noted as averaging 19,800 good canes per acre.

Spanish sulla [soola].—Tested at Ruakura farm of instruction, A. W. GREEN (*Jour. Agr. [New Zeal.]*, 9 (1914), No. 2, pp. 133-135, fig. 1).—This article gives results showing a superiority of Spanish sulla or Maltese clover (*Hedysarum coronarium*) over the African variety. The former produced an estimated yield of 11 tons of green forage per acre and grew to a height of 3 ft. 6 in.

The sweet potato: How to grow and keep it, J. G. NORDIN (*Russellville, Ark.*, 1912, pp. 50, figs. 14).—In this book the author gives the results of his ten years' experience in the production, storage, and marketing of sweet potatoes.

The chemical composition of Philippine sweet potatoes, S. D. LABAYEN (*Philippine Agr. and Forester*, 3 (1914), No. 4, pp. 79, 80).—This article reports analyses of 28 varieties of sweet potatoes grown on the college farm.

It is noted that specific gravity bore little relation to the content of starch or moisture and could not be used as an index of the commercial value of the sweet potatoes. The percentage of moisture varied from 66.08 to 77.09, the starch from 10.11 to 26.3, and the yield from 4,200 to 24,160 kg. per hectare (3,738 to 21,502 lbs. per acre).

Lax and dense-eared wheats, W. H. PARKER (*Jour. Agr. Sci. [England]*, 6 (1914), No. 3, pp. 371-386, pl. 1, fig. 1).—This paper discusses methods of earlier investigators in determining the density of heads of wheats in making classifications, and gives results of experiments to show the advisability of using accurate measurements of the internodes of the rachis from which averages for the heads were obtained to indicate the different classes of density, as well as in a study of the factors that make for dense or lax heads.

The effect of rate of seeding on competition in wheat varieties, A. E. GRANTHAM (*Jour. Amer. Soc. Agron.*, 6 (1914), No. 3, pp. 124-128).—The results of sowing a large number of varieties of wheat at the rates of 100, 200, and 400 kernels per 10 feet of row show for bearded varieties the decrease in yield of grain from the thin to the medium seeding to be 18 per cent, from the medium to the thick 23 per cent, and from the thin to the thick 37 per cent. For the beardless varieties the decreases were 34, 51, and 68 per cent, respectively.

“These results indicate that there is a great difference in varieties as to the effect produced by the competition induced by the different rates of seeding. It appears that the beardless varieties are less able to withstand the heavier seeding.”

Wheat.—A practical discussion of the raising, marketing, handling, and use of the wheat crop, relating largely to the Great Plains region of the United States and Canada, A. M. TEN EyCK (*Lincoln, Nebr.*, 1914, pp. 194, figs. 39).—This book, especially prepared for the wheat growers of the dry land farming section of the United States, embodies the author's experience on the raising, marketing, handling, and uses of the wheat crop.

The value of the biological method of determining varieties of agricultural seeds, A. CAUDA (*Ann. R. Accad. Agr. Torino*, 56 (1913), pp. 357-376).—This article discusses the precipitin method and gives results of trials with several genera of agricultural seed which show that all genera do not respond to the serum treatment. A bibliography of 18 titles is appended.

Zellers' barley and ear corn table for wagonloads, M. T. ZELLERS (*Hooper, Nebr.*, 1911, pp. 44).—This gives values of loads of barley weighing from 1,400 lbs. to 3,790 lbs., and of ear corn weighing from 1,600 lbs. to 3,990 lbs. at prices ranging from 25 cts. to 74 cts. per bushel.

HORTICULTURE.

The killing of plant tissue by low temperature, W. H. CHANDLER (*Missouri Sta. Research Bul.* 8 (1913), pp. 143-309, pls. 4).—The work reported in this paper was begun during the season of 1904-5. While the studies were undertaken primarily to determine the effect of certain cultural methods on the hardiness of peach fruit buds under climatic conditions that prevail in the southern half of Missouri, they have been so extended as to embrace a general study of the “freezing to death” of plant tissue. In addition to peaches and other orchard fruits many vegetables and other cultivated plants have been included in the author's experimental studies. The results of this work are here tabulated and fully discussed in connection with the results secured by various investigators. An extensive bibliography of cited literature is given. The subject matter is presented under the following general headings: Review of literature on freezing, effect of sap density on temperature, other features that influence the freezing to death of plants, effect of previous exposure to temperature slightly above killing temperature, relation of low temperature to peach growing, varieties with the longest rest periods, effect of vigor of trees on rest

periods, breeding varieties hardy under Missouri conditions, killing of apples, and killing of cherries and plums.

The most commonly accepted theory dealing with the freezing to death of plant tissues seems to be that killing from cold is due to the withdrawal of water from the protoplasm. Results of many investigations show that the water generally moves out of the cells to form ice crystals in the intercellular spaces. The amount of water loss necessary to result in death varies with different plants and different tissues. Experimental data secured by the author lead him to conclude that freezing to death can not be attributed to precipitation of proteids, as claimed by some investigators.

The author's experiments with seedlings of various plants and with twigs bearing small apples, peaches, and cherries show that for plant tissues that kill at relatively high temperature the killing temperature is reduced whenever the sap density or molar concentration of the sap of the tissue is increased. In these studies increases in sap density were brought about by using mineral salt solutions and also by watering the seedlings sparingly. When sap density was reduced by shading the plants the amount of killed tissues at a given temperature was increased.

Attempts to increase the sap density of winter peach wood and buds by fertilizing peach plats with potassium chlorid were unsuccessful. Examinations made in winter, spring, and summer failed to show any difference in sap density between the plats fertilized with potash and those receiving no potash. Likewise the action of spring frost on the bloom and of winter cold on the buds was not influenced by the application of potash to the soil.

Practically all plants used in freezing experiments in this work were tested with reference to the effect of rapid thawing. The results show that in addition to ripe apples, pears, and the leaves of *Agave americana* observed by Müller-Thurgau and Molisch, leaves of lettuce kill at slightly lower temperature if they are thawed slowly than if thawed rapidly. In the case of all other tissues tested, either by the author or by others, however, including unripe apples and pears, there is no indication that the rate of thawing has anything to do with the amount of killing at a given temperature. Rapid wilting of tissue has not generally increased the resistance of plants to low temperature over that of unwilted tissue with a dry surface. Tissue with a wet surface killed worse at a given temperature than did tissue with no moisture on the surface. Slow wilting or partial withholding of water through a long period was found to increase the resistance of tissue to low temperature. In case of hardy winter buds and wood a rapid decline in temperature greatly increased the severity of injury from a given low temperature. Previous exposure of plant tissue to low temperature above that at which the tissue kills seems to increase its resistance to low temperature.

As between different plants there appears to be no constant relation between the rate of growth of plant tissue and resistance to low temperature. Young leaves of fruit trees kill at a higher temperature than old mature leaves, whereas the young leaves of lettuce withstand a lower temperature than do the older leaves. With fruit trees the most important feature affecting the hardiness of plant tissue is maturity. Maturity in the case of cambium may be intimately associated with the process of drying out. With the cortex, however, there is little difference between the moisture content of unfrozen cortex in seasons when it is very tender and seasons when it is hardy. The wood at the base of the trunk and at the crotches of all rapidly growing branches seems to reach a condition of maturity in early winter more slowly than do most other tissues. Of the tissues above ground during periods when most complete maturity is reached the most tender parts are the pith cells and the fruit buds. In periods

of rapid growth there is little difference in hardness of the different tissues. The root tissue is the most tender at all seasons and the difference in the killing temperature of roots in summer and winter is much less than that of the killing temperature of twigs or other wood in summer and winter. The resistance of the root system is greater in the parts nearest the surface. Roots of the French crab apple stock seemed to be more tender than roots of the average apple variety. Marianna plum roots were found to be more hardy than Myrobolan roots and Mahaleb cherry roots were slightly more hardy than Mazzard roots.

Pollen of the apple was found to withstand much lower temperature than any other tissue when in full bloom. Peach buds frozen in the laboratory with the scales removed were slightly more resistant to low temperature than were buds with the scales not removed.

With reference to the killing of the wood of peach trees from freezing the author concludes that little can be done to influence the amount of killing except to have the trees started into winter in proper condition of maturity. Trees one or two years in the orchard or old weak trees are most liable to succumb to the effects of low temperature. With trees that have been winterkilled, although apparently in the best condition of maturity, pruning the trees severely seems to reduce the subsequent amount of killing. On the other hand, when the wood has been winterkilled because it has not reached the proper condition of maturity in the fall subsequent heavy pruning is liable to result in greater loss. The hardness of peach buds when in fully dormant condition seems to be greatly increased by continuous low temperature previous to unusually severe temperature. The most important factor influencing the loss of peaches from low temperature in winter is keeping the buds from starting into growth during warm periods in winter. In south Missouri and Arkansas at least the best means of accomplishing this end is prolonging the growth of the trees in autumn, either by heavy pruning or by fertilizing with nitrogen the spring before. Some varieties of peaches have a much longer rest period than other varieties and therefore start into growth more slowly during warm winter periods.

For Missouri conditions the killing temperature of peach blossoms when the tree is just coming into bloom varies from 22 to 26° F. After pollination and until the peaches are a half inch in diameter at least they continue to become more tender until they will withstand but very few degrees below the freezing point, the seeds of young peaches killing at a higher temperature than other peach tissue. No evidence was secured from the author's investigations to show that early varieties of peaches start into growth more readily during warm periods in winter than do later varieties. After blooming time, however, the early peaches grow much more rapidly and are much more liable to be killed by a freeze after the fruit is set.

The killing of apple wood is of considerable importance in some apple-growing sections, among the common injuries being root killing, crown rot, crotch injury, sunscald, trunk killing, and killing back of top and branches. The killing of apple buds from low temperatures has not been commonly observed. The blossoms and young fruit of the apple, however, will not generally withstand as low temperature as will the blossoms or young fruit of equal age of the peach. Cherry and plum buds are more resistant than peach buds but are frequently killed in some sections. The young fruit of the Wild Goose plum is among the most resistant to late frost in the spring.

In connection with this study temperature records were secured and a chart is given showing the maximum and minimum temperature curves at Columbia and Koshkonong, Mo., during the years 1901-1912, including the season begin-

ning December 1 and extending generally to the dates at which buds were killed in February when such killing occurred. Maximum and minimum temperature curves for Geneva, N. Y., covering a similar period from January, 1908, to February, 1910, are also given.

Multiplicity of crops as a means of increasing the future food supply, U. P. HEDRICK (*Science, n. ser.*, 40 (1914), No. 1035, pp. 611-620).—A presidential address delivered before the Society for Horticultural Science at Washington, D. C., in 1913. The author calls attention to the possibility of domesticating and improving through hybridization many native fruit and other plants not now cultivated, but which might be made important contributions to the future food supply.

[Horticultural investigations in Alaska], C. C. GEORGESON ET AL. (*Alaska Stas. Rpt. 1913*, pp. 7-9, 11-13, 33-35, 46-48, pls. 2).—The horticultural work at the Sitka Station and at the branch stations was continued along the lines previously noted (E. S. R., 29, p. 742).

At the Sitka Station the best of the hybrid strawberry seedlings are being tested further and a few of the varieties are soon to be propagated for distribution. Several hundred new seedlings were raised during the year and it is planned to continue the hybridization work. The hill system of culture has proved to be superior to the matted row system in the moist climate at Sitka.

An abundance of fruit was set in the test fruit orchard, but owing to some undetermined cause the fruit all dropped off in late summer. Apples and sour cherries were both subject to this trouble. The work with apples thus far indicates the superiority of dwarf trees over standards, and the native crab apple (*Pyrus rivularis*) is being tested as a stock for dwarfing cultivated varieties. Some crosses have been made between cultivated varieties and the native crab.

The usual variety tests with vegetables were continued.

Operating costs of a well-established New York apple orchard, G. H. MILLER (*U. S. Dept. Agr. Bul. 130* (1914), pp. 16, figs. 3).—In this bulletin the author presents a plan of cost accounting for orchard operations which is based upon cost data secured on a mature orchard operated in connection with a general farm in western New York and presented in detail.

Plum and prune culture, W. J. ALLEN (*Dept. Agr. N. S. Wales, Farmers' Bul. 86* (1914), pp. 31, figs. 41).—A popular treatise on the culture of plums and prunes.

Prune culture, F. PENEVEYRE (*Le Prunier. Paris and Villefranche* [1914], pp. 57, figs. 27).—A brief practical treatise on the culture and preparation of prunes.

A handbook of tropical gardening and planting, with special reference to Ceylon, H. F. MACMILLAN (*Colombo, Ceylon, 1914, 2. ed.*, pp. X+662+XXXV, pl. 1, figs. 258).—The present edition of this handbook (E. S. R., 24, p. 642) has been fully revised and enlarged to include a number of additional subjects.

New method of growing bananas, M. S. BERTONI (*Bol. Min. Fomento [Venezuela]*, 9 (1914), No. 9, pp. 660-677).—The principal feature of the method here described consists in allowing all prunings and mowings, with the exception of certain harmful weeds and grasses, to rot on the ground, thus forming a mulch and adding to the organic material in the soil. By adopting this form of mulching the author claims that the life of a banana plantation may be extended for several years.

[Cacao manurial plats in Dominica] (*Imp. Dept. Agr. West Indies, Rpt. Agr. Dept. Dominica, 1913-14*, pp. 40-47).—A progress report on the manurial experiments with cacao. The results secured are similar to those previously noted (E. S. R., 30, p. 741).

Indian cashew nut industry, H. D. BAKER (*Daily Cons. and Trade Rpts.* [U. S.], 17 (1914), No. 258, pp. 566, 567).—Notes are given on the culture, production, uses, and commerce of cashew nuts, with special reference to India.

The coconut and its products, with special reference to Ceylon, D. S. PRATT (*Philippine Jour. Sci.*, Sect. A, 9 (1914), No. 2, pp. 177-199, pls. 5).—A general and statistical account of the cultivation of coconuts and the preparation of various commercial coconut products in Ceylon.

Manurial experiments in connection with lime cultivation (*Imp. Dept. Agr. West Indies, Rpt. Agr. Dept. Dominica, 1913-14*, pp. 29, 30).—A brief progress report on fertilizer experiments with lime trees that were started at the Dominican Station in 1913.

The sugar palm, O. W. BARRETT (*Philippine Agr. Rev.* [English Ed.], 7 (1914), No. 5, pp. 216-221, pl. 1).—A discussion of the sugar palm (*Arenga saccharifera*) of the Philippine Islands with reference to its characteristics and utilization. The author is of the opinion that under improved methods of culture the kaong should prove of considerable importance to the Philippine planter as a source of fiber, starch, and sugar.

Tea manuring experiments, II, C. BERNARD and J. J. B. DEUSS (*Dept. Landb., Nijv. en Handel* [Dutch East Indies], *Meded. Proefstat. Thee*, No. 30 (1914), pp. 1-29).—Additional data are given on fertilizer investigations with tea conducted in different gardens in Java (E. S. R., 30, p. 43).

Tea manuring experiments at Malabar, K. A. R. BOSSCHA (*Dept. Landb., Nijv. en Handel* [Dutch East Indies], *Meded. Proefstat. Thee*, No. 30 (1914), pp. 30-38).—Some fertilizer tests conducted in a tea garden at Malabar are reported.

Studies in Juglans.—II, Further observations on a new variety of *Juglans californica* Watson and on certain supposed walnut-oak hybrids, E. B. BABCOCK (*Univ. Cal. Pubs. Agr. Sci.*, 2 (1914), No. 2, pp. 47-70, pls. 7).—In a previous study (E. S. R., 30, p. 644) relative to the origin of this new form of walnut the author advanced as working hypotheses those of hybridization, teratology, and mutation. As the result of the study reported in the present paper it is concluded that there is no evidence to show that *J. californica quercina* originated through hybridization with other walnuts or with oaks. Also, the new variety does not appear to have been caused by teratology. The evidence, as a whole, indicates that the *Quercina* walnut is a mutation similar in nature to certain mutations in the tomato, cotton, tobacco, and evening primrose, which have been designated as aggregate mutation.

A bibliography of cited literature is given.

Rhamnus purshiana, its history, growth, methods of collection, and bibliography, C. W. JOHNSON and EDITH HINDMAN (*Amer. Jour. Pharm.*, 86 (1914), No. 9, pp. 387-413, figs. 8).—A descriptive account of the cascara sagrada industry in the Pacific Northwest.

The cultivation and collection of medicinal plants in England, W. A. WHATMOUGH (*Jour. Bd. Agr.* [London], 21 (1914), No. 6, pp. 492-510, pls. 8).—This comprises notes on the cultural requirements of the more important British drug plants.

Plant diseases and pests regulations (*Dept. Agr. Mauritius, Gen. Ser., Bul.* 2 (1914) [English Ed.], pp. 10).—This comprises a summary of the port of entry and internal regulations in force in Mauritius in respect to plant diseases and pests.

FORESTRY.

Michigan manual of forestry.—I, Forest regulation or the preparation and development of forest working plans, F. ROTH (*Ann Arbor, Mich.*, 1914,

vol. 1, pp. IX+218, figs. 9).—A treatise on the preparation and development of forest working plans with reference to their application in forestry in the United States. A bibliography of literature on forest regulation is included, and a brief review of the treatment of forest regulation by some of the leading German authorities is appended.

Acts of assembly relating to forests and forestry, edited by J. KALBFUS (In *Digest of the Game, Fish, and Forestry Laws, 1913. Harrisburg, Penn.: State, 1913, pp. 237-300*).—The text is here given of all the acts passed by the Pennsylvania Assembly through the year 1913 relating to forests and forestry.

Forest administration in the colonies (*Bibliothèque Colon. Internat., Inst. Colon. Internat., Bruxelles, 11. ser., 1914, vols. 1, pp. 551; 2, pp. 516; 3, pp. 505*).—This comprises a symposium dealing with the forest laws and forest administration in the colonies of Great Britain, Holland, Germany, Italy, and France, the Philippines, Hawaii, Porto Rico, etc. The subject matter was prepared by various authorities.

A review of the net revenues from the Saxony state forests for the year 1912, VOGEL (*Tharand. Forstl. Jahrb., 65 (1914), No. 3, pp. 196-210*).—This is the usual statistical review for the year 1912 relative to the yield in lumber and minor forest products, receipts, expenditures, and net returns from the state forests in the various districts of Saxony.

The influence of soil strata in drifting sand in the vicinity of Darmstadt upon the growth of forest trees, W. SCHOTTLER (*Notizbl. Ver. Erdk. Darmstadt, 4. ser., No. 34 (1913), pp. 51-71*).—An analytical study of several types of soil in the drifting sand region about Darmstadt, with special reference to the occurrence and growth of various kinds of trees.

A fertilizer experiment in forest nurseries, P. VON RUŠNOV (*Mitt. Forstl. Versuchsw. Österr., No. 38 (1914), pp. 56-64*).—The results are given of a cooperative fertilizer test conducted in a number of forest nurseries in Austria. The work as a whole indicates that phosphatic fertilizers have had practically no influence on the growth of spruce and pine seedlings.

A thinning experiment with Douglas fir (*Pseudotsuga taxifolia*), A. KUBELKA (*Mitt. Forstl. Versuchsw. Österr., No. 38 (1914), pp. 9-34, figs. 8*).—Growth data are given for a Douglas fir stand which was thinned in 1905, when 18 years old, and again in 1910.

Timbers from various countries (*Bul. Imp. Inst. [So. Kensington], 12 (1914), No. 3, pp. 360-370, fig. 1*).—Data are given on the working qualities and mechanical tests of several timber species from parts of Africa and from British Guiana.

Density of wood substance and porosity of wood, F. DUNLAP (*U. S. Dept. Agr., Jour. Agr. Research, 2 (1914), No. 6, pp. 423-428*).—The investigation, the results of which are here presented in tabular form, was made to determine the density of the lignocellulose which makes up the walls of the cells of which wood is composed as a basis for calculating the porosity of wood. The woods tested included longleaf pine, Douglas fir, Pacific yew, mockernut, beech, red oak, and sugar maple. The experimental methods are described.

Although the range in density of wood substance for the seven species tested was nearly $4\frac{1}{2}$ per cent, it is concluded that for practical purposes this density may be considered uniform, with a value of 1.54. Since most commercial woods have a density between 0.3 and 0.6 it appears that the unoccupied space in a block of wood may be from four-fifths to two-fifths of its volume.

The application of these results to the calculation of porosity of crossties is illustrated with data previously secured in the preservative treatment of red oak ties (E. S. R., 20, p. 344).

Note on the absorption of water by certain timbers, R. S. PEARSON (*Indian Forester*, 40 (1914), No. 10, pp. 513-515, pl. 1).—Data are given on the behavior of a number of Indian species of timber, with special reference to the absorption of moisture when completely immersed in water and the evaporation of moisture from the timber after removal from the water.

The lumber industry.—II-III, IV (*U. S. Dept. Com., Rpt. Comr. Corporations on Lumber Indus.*, pts. 2-3 (1914), pp. XX+264, pls. 13; 4 (1914), pp. XXI+933, pls. 32).—Part II of the statistical survey of the lumber industry of the United States continues the subject of standing timber discussed in part I (*E. S. R.*, 30, p. 844). The Concentration of Timber Ownership in Important Selected Regions of the timber area is discussed in detail and illustrated by ownership maps of large regions in Washington, Oregon, California, Idaho, and Louisiana.

Part III deals with Land Holdings of Large Timber Owners, showing a corresponding concentration of land ownership which was observed in connection with the study of timber. The main fact brought out is that 1,694 timber owners hold in fee 105,600,000 acres, or over one-twentieth of the land area of the United States.

Part IV deals with Conditions in Production and Wholesale Distribution, including Wholesale Prices, also including combinations among manufacturers and wholesalers to fix prices.

The method and purpose of securing velocity measurements in the management of log slides, J. GLATZ (*Mitt. Forstl. Versuchsw. Österr.*, No. 38 (1914), pp. 1-8, pl. 1, figs. 2).—The author here describes a method of equipping experimental log slides with electrical apparatus for making velocity determinations of various kinds and classes of logs, the object of such measurements being to secure fundamental data for the proper construction of slides.

Yields from the destructive distillation of certain hardwoods, L. F. HAWLEY and R. C. PALMER (*U. S. Dept. Agr. Bul.* 129 (1914), pp. 16, figs. 3).—The investigation here described was undertaken in order to furnish information relative to the distillation value of certain hardwoods not usually used for distillation, such as the oaks, red gum, tupelo, and hickory. Comparative data on species commonly used for distillation, such as beech, birch, and maple, were also secured. The results are considered to be of especial interest to manufacturers of by-products.

Resin tapping in Austria, A. KUBELKA (*Mitt. Forstl. Versuchsw. Österr.*, No. 38 (1914), pp. 35-55, figs. 2).—A descriptive account of the resin and turpentine industry in Austria, including information relative to resin yielding trees, methods of tapping, silvicultural management of black pine stands, and distillation processes.

Tables and instructions for use with latex hydrometer, B. J. EATON (*Agr. Bul. Fed. Malay States*, 2 (1914), No. 12, pp. 314-322).—The tables and instructions here given are intended for use with the hydrometer, previously described by the author (*E. S. R.*, 31, p. 444).

DISEASES OF PLANTS.

[Plant diseases in Ontario], J. E. HOWITT (*Ann. Rpt. Ontario Agr. Col. and Expt. Farm*, 39 (1913), pp. 35-38, 45-49, figs. 3).—The author states that during the past season the plant diseases which received the most attention at the Ontario Agricultural College were potato scab, black knot, orange rust of blackberries, hollyhock rust, loose smut of oats, dry rot of potatoes, club root of turnips and cabbage, *Fusarium* blight of asters, plum pockets, leaf spot or

shot hole disease of plums and cherries, fruit rot of tomatoes, and blossom end rot of tomatoes.

Plant diseases noted as comparatively new in Ontario are club root of cruciferous plants, powdery or corky scab of potatoes, and yellows and cane blight of raspberries. Protective measures are suggested.

Experiments with late blight of celery are said to indicate that loss from this cause can be prevented by spraying with Bordeaux mixture every two weeks beginning with the plants in the seed bed. Lime sulphur did not prove to be so effective.

Rose leaf blotch was somewhat lessened by use of Bordeaux mixture, and was controlled by use of lime sulphur repeated every 10 days from May 2 to June 12 and then from August 4 to September 15.

An observation of the apothecial stage of *Sclerotinia cinerea* was reported as supposedly the first instance of such observation in Ontario. Plowing under mummied fruit would appear to be ineffective as prevention, if, as seems probable, apothecia are produced from old fruits which have been buried a year or more in the soil and then brought to the surface by fresh plowing. These observations are to be continued.

The Uredinales, A. TROTTER (*Flora Ital. Crypt.*, 1 (1914), No. 12, pp. 337-519, figs. 33).—This is the concluding number of this study, the first two having been noted previously (E. S. R., 26, p. 243). It gives in addition to genera and species previously listed a number of others known in Italy, also lists of imperfect Uredinales, a general supplement to the work, and an alphabetical index of the fungi along with one of host plants.

Preliminary notes on the cultivation of the plant parasitic nematode, *Heterodera radiculicola*, L. P. BYARS (*Phytopathology*, 4 (1914), No. 4, pp. 323-326, pl. 1).—The author describes a method which has been successfully employed in cultivating nematodes for inoculation studies and other investigations.

In connection with this investigation a method of growing host plants under sterile conditions was elaborated, and a brief description of the method is given.

[Grain smuts], C. A. ZAVITZ (*Ann. Rpt. Ontario Agr. Col. and Expt. Farm*, 39 (1913), pp. 132-135).—Reporting on experiments carried out for five years in testing out practically some of the most highly recommended treatments for loose smut of oats and stinking smut of wheat, the author states that the greatest yields per acre of both winter wheat and oats were produced from grain which had been immersed for 20 minutes in a solution of $\frac{1}{2}$ pint of formalin to 21 gal. of water, this treatment effectually killing the smut.

A 12-year series of smut immunity tests on oats appeared to show that great differences in susceptibility exist. The Early Ripe variety is almost immune to smut, while Black Tartarian is extremely susceptible to its attacks.

The treatment of seed wheat, H. ROSS (*Agr. Gaz. N. S. Wales*, 25 (1914), No. 3, pp. 237, 238).—The author describes a method of treating seed wheat to prevent stinking smut. The wheat in bags is thoroughly shaken for three minutes in 5 per cent copper sulphate solution (any unbroken bunt balls being skimmed off as they appear), then drained for 10 or 15 minutes, avoiding contact with any iron or tin surface. If the seed is to be dried before planting, it is necessary and in any case advisable that a 0.5 per cent solution of freshly burnt lime be allowed to settle, the clear lime water drained off and the seed immersed into this for two or three minutes. The lime water should be frequently made afresh as used to prevent its becoming acid.

A disease involving the dropping of cotton bolls, J. L. HEWITT (*Phytopathology*, 4 (1914), No. 4, pp. 327-332, pl. 1, figs. 2).—The author reports the dropping of partially grown cotton bolls in fields in many parts of Arkansas

during the summer of 1913. The injury was widely spread, being most marked in the bottom-land districts, where in some cases more than one-half of the bolls had fallen by the last of August.

It is stated that not sufficient work has been done to determine the cause of the injury, although from the general appearance it is thought to be due to some organism, probably a fungus.

The Mycogone disease of mushrooms and its control, F. J. VEIHMEYER (*U. S. Dept. Agr. Bul. 127 (1914), pp. 24, pls. 3, figs. 5*).—A description is given of a disease of cultivated mushrooms, which is thought to be probably due to *M. pernicioso*.

The removal of the diseased mushrooms as soon as they appear and the fumigation of the house with formaldehyde gas are recommended as methods of control. A bibliography is appended.

Notes on potato diseases from the Northwest, F. D. BAILEY (*Phytopathology, 4 (1914), No. 4, pp. 321, 322, pl. 1*).—Brief descriptions are given of silver scurf due to *Spondylocadium atrovirens*, which is said to have been reported in Oregon and western Washington, a disease caused by *Stysanus stemonitis*, and a root rot of potatoes due to the attacks of *Armillaria mellea*.

The southern bacterial wilt in New Jersey, M. T. COOK (*Phytopathology, 4 (1914), No. 4, pp. 277, 278, fig. 1*).—The author reports the occurrence in epidemic form of the potato wilt due to *Bacillus solanacearum*, and reports some correspondence indicating that the tomato was also attacked, but not so severely as the potato plant. The severity of the disease on the potato was thought to be probably due to a very mild winter followed by an exceptionally dry growing season for the early potato crop.

Some diseases of the potato.—I, Bacterial wilt or vrot-pootje, ETHEL M. DOIDGE (*Agr. Jour. Union So. Africa, 7 (1914), No. 5, pp. 698-703, figs. 3*).—This is a brief description of the methods and results of infection of the potato by *Bacillus solanacearum*, which is known to harbor also in several other related plants named as of common occurrence.

No cure is offered, but preventive measures include removal and destruction at once of all wilted plants, care to prevent wounding in transplanting in case of tomatoes, etc., and keeping down solanaceous plants in infected soil. Leaf-eating insects are also to be exterminated.

Leaf spot, a disease of the sugar beet, C. O. TOWNSEND (*U. S. Dept. Agr., Farmers' Bul. 618 (1914), pp. 18, figs. 10*).—A popular description is given of the leaf spot of sugar beets due to *Cercospora beticola*, which the author says may be controlled on a commercial scale by thorough rotation of crops and deep fall plowing. A proper and uniform supply of soil moisture, spraying, and the proper disposition of beet tops and stable manure are also important aids. The disease is said to be distributed by wind, water, insects, and man and other animals; and it reduces the tonnage and sugar content of the beet, as well as seriously injures the feeding value of the beet tops.

The stem rot of the sweet potato, L. L. HARTER and ETHEL C. FIELD (*Phytopathology, 4 (1914), No. 4, pp. 279-303, pls. 3, figs. 2*).—According to the authors the stem rot of sweet potatoes may be caused by either *Fusarium batatatis* or *F. hyperoxysporum*. These organisms are vascular parasites, invading the bundles of all parts of the plant and producing a brown discoloration. Heavy losses are reported through stem rot in some localities, notably in New Jersey and Delaware. Stem rot results in a loss of stand and decrease in yield. The majority of infections take place in the field, although it is said the organism may grow from diseased potatoes into the slips produced therefrom.

Careful selection of seed and careful sterilization of seed beds should be adopted.

Both species of *Fusarium* have been successfully inoculated into the wild ivy-leaved morning glory, but they have proved not parasitic to eggplants, tomatoes, peppers, clover, Irish potatoes, or several species of *Ipomœa*. All attempts to produce the stem rot of sweet potato with *Nectria ipomœæ*, which may be commonly found on rotting sweet potatoes in storage, have been unsuccessful.

Recent studies of some new or little known diseases of the sweet potato, J. J. TAUBENHAUS (*Phytopathology*, 4 (1914), No. 4, pp. 305-320, pls. 3).—This is a detailed account of a paper presented before the American Phytopathological Society (E. S. R., 31, p. 447), in which charcoal rot (*Sclerotium bataticola*), a soft rot and ring rot (*Rhizopus nigricans*), vine wilt or yellows (*Fusarium batatatis*), and a new leaf spot (*Septoria bataticola* n. sp.), are described.

Wintering of timothy rust in Wisconsin, C. W. HUNGERFORD (*Phytopathology*, 4 (1914), No. 4, pp. 337, 338).—In a brief note the author states that uredospores of timothy rust can live over winter and infect the new growth in the spring, and it is probable that the mycelium lives over winter as far north as Madison, Wis. The teleutospores of the timothy rust are said to be not plentiful and are found only in shady places, along fences or edges of woods.

[Orchard diseases and treatments], L. CAESAR (*Ann. Rpt. Ontario Agr. Col. and Expt. Farm*, 39 (1913), pp. 28-31).—Part of this report deals with work done in combating fire or twig blight of pears, which was controlled though in an advanced stage; little peach and yellows, which are being rapidly brought under control by carefully inspecting, marking, and destroying diseased trees; apple scab, which was readily controlled by spraying in some parts of Ontario, but scarcely at all in numerous others; and winter injury, which was studied, but will require observation extending through some years.

A new pomaceous rust of economic importance, *Gymnosporangium blasdaleanum*, H. S. JACKSON (*Phytopathology*, 4 (1914), No. 4, pp. 261-270, pls. 2, fig. 1).—This is a detailed account of an investigation previously reported (E. S. R., 31, p. 345).

A fruit spot of the Wealthy apple, E. C. STAKMAN and R. C. ROSE (*Phytopathology*, 4 (1914), No. 4, pp. 333-336, pl. 1).—A spot of Wealthy apples is said to have been very prevalent in Minnesota in 1911. It was less widely spread in 1912, but in 1913 assumed considerable importance. Only ripe apples seemed to be affected in the field, especially those which have been left too long and were slightly overripe. In cellars spots were found to occur within a short time after storage, in some cases as many as 60 per cent of the fruits being badly affected. While most prevalent on the variety Wealthy, it was found to attack a number of other varieties.

Careful microscopic examinations made of the spots showed the presence of mycelium which proved to be the mycelium of an *Alternaria*. Inoculation experiments failed except where the apples had been injured. Even under the most favorable conditions the fungus did not seem to be able to penetrate the unbroken skin. The primary cause of the disease is said to be still a matter of doubt, although the *Alternaria* occurred in such a large percentage of spots as to indicate that possibly it was associated with the disease, but further study will be necessary before definite conclusions regarding it can be reached.

An unusual host of *Fomes fomentarius*, J. R. WEIR (*Phytopathology*, 4 (1914), No. 4, p. 339).—The author reports the occurrence of this fungus on various varieties of apple trees in an abandoned orchard near Missoula, Mont. *F. applanatus* or *F. leucophæus*, as the American form is commonly designated, is said to be more common in the West on cultivated fruit trees.

The cankers of *Plowrightia morbosa* in their relation to other fungi, J. R. WEIR (*Phytopathology*, 4 (1914), No. 4, pp. 339, 340).—The author states that throughout Montana the cankers formed by this parasite on *Prunus* and *Ame-lanchier* are frequently infected by *Fomes ignarius*. Not infrequently the same knots are infected by *Nectria cinnabarina*, and in one instance *Stereum hirsutum* and *Polystictus hirsutus* had become established in the plum knots. The fungus, which is well known on cultivated species of *Prunus*, is reported occurring on four species of *Prunus* in the northwestern part of this country.

Some notes on the black knot of plums and cherries, J. A. MCCLINTOCK (*Rpt. Mich. Acad. Sci.*, 15 (1913), pp. 142-144).—Giving an account of studies with *Plowrightia morbosa* on plum and cherry trees during 1911-1913, the author states that some asci were found able to shoot their spores to a distance of more than 1 cm. upward, and that these spores germinated within 48 hours, but only from the larger of the two cells. Mycelium developing from portions of diseased branches and pycnosporos developing therefrom did not produce in plum or cherry trees tested the characteristic symptoms of black knot. Mycelium of *P. morbosa* could not be induced to pass from diseased grafts to sound wood, but knots did develop on neighboring branches, and as it was too early for conidia to be present, it is concluded that these infections resulted from ascospores shot out from knots on the diseased graftwood. No results were obtained from attempts to inoculate with conidia or to germinate conidia in drop cultures.

Diseased twigs cut at random from plum trees November 3, 1912, showed no asci or spores at that time, but these twigs left on the ground as if dropped in pruning showed some perithecia with ascospores on most specimens December 25. Twigs left on the ground until March 12, 1913, developed perithecia which proved able to shoot their spores, this fact showing such twigs to be a possible source of infection after lying on the ground all winter and suggesting their immediate destruction when cut from the trees in autumn.

Dead-arm disease of grapes, D. REDDICK (*New York State Sta. Bul.* 389 (1914), pp. 463-490, pls. 6, figs. 3).—In continuation of a previous publication (E. S. R., 21, p. 148), the author describes a disease of grapes which is said to occur on practically every variety of grape grown commercially within the State, and it is known to be present in practically every grape-growing section.

The most striking symptoms of the disease are the presence of bare arms in the spring and the occurrence of dwarfed, crinkled, yellowish-colored leaves during the early part of the growing season. The cause of the disease is said to be *Cryptosporella viticola*. The fungus has been studied and its pathogenicity established by numerous inoculation experiments.

The method of control described includes the marking and removing of all vines showing symptoms of the disease. Suckers originating from beneath the surface of the ground are said to develop strong and vigorous vines almost invariably unless infected by spores during the first few weeks of their development.

"Dead arm" of grapevines, F. H. HALL (*New York State Sta. Bul.* 389, popular ed. (1914), pp. 4, pls. 2).—A popular edition of the above.

Fungus diseases [of cranberries], H. J. FRANKLIN (*Ann. Rpt. Cape Cod Cranberry Growers' Assoc.*, 26 (1913), pp. 24-29).—In the course of a more general report, the author details experiments looking to the control of blossom end rot of cranberries.

It is believed that fertilizers will give their best results in forcing fruit production only when the vines are comparatively free from fungus disease. It is thought that injury of some sort could in some instances be traced to spraying while in bloom with lime sulphur, with Bordeaux mixture, and with nitrate of

soda. Copper sulphate was used in the flowage on the flooding sections at the state bog on June 3 and 16 from 11 to 23 hours, but the effects on the crop as to quantity and keeping quality can not yet be announced. Resanding seems to favor the development of fungus disease.

Cranberry spraying experiments in Massachusetts in 1912, C. L. SHEAR (*Ann. Rpt. Cape Cod Cranberry Growers' Assoc.*, 26 (1913), pp. 9-14).—The author reports that Bordeaux mixture materially lessens cranberry diseases, greatly reducing not only the rot or softening of berries which develops before picking but also much of that which ordinarily develops in storage and transportation, in addition to its stimulating influence on the vital activities of the growing plant. It is claimed that four thorough sprayings should prove satisfactory and profitable, the cost of application varying according to the condition of the vines at the time.

Citrus canker, F. A. WOLF and A. B. MASSEY (*Alabama Col. Sta. Circ.* 27 (1914), pp. 97-102, figs. 6).—According to the authors, their attention was called early in 1914 to a citrus disease in the vicinity of Mobile, Ala., to which the popular name citrus canker was given. A study has shown that the disease is widely distributed throughout southern Alabama and it is believed that it exists in other Gulf States.

Grapefruit seems to be more subject to the canker than any other citrus fruit, the leaves, young twigs, older branches, and fruit all being subject to attack. On *Citrus trifoliata* the disease is thus far known to attack only the twigs and branches. The Satsuma orange seems to be slightly subject to the attack, a spotting of the leaves being the only evidence so far observed. The sweet orange is said to be more resistant than the Satsuma, and the kumquat is not subject to attack.

Several fungi have been found associated with the spots and cankers, but the authors consider it caused by a species of *Phoma*. Inoculation experiments made from pure cultures taken from grapefruit twigs developed the characteristic symptoms of the disease in about three weeks.

Experiments are being conducted for the control of the disease, and the preliminary results indicate the effectiveness of spraying with Bordeaux mixture, ammoniacal copper carbonate, or soluble sulphur. As a precaution the authors recommend the removal and burning of all diseased parts and spraying the trees thus pruned at intervals of several weeks.

A gumming disease affecting lemon fruits, E. JARVIS (*Queensland. Agr. Jour.*, n. ser., 1 (1914), No. 5, pp. 345-348, fig. 1).—A report with discussion is given of a diseased condition appearing annually in late summer and autumn on several varieties of lemons growing on different classes of soil and on trees from grafts on different stocks.

The disease is provisionally regarded as bacterial, other factors probably being involved. Unsuitability of climate may be primarily responsible and suspicion as regards the carrying of infection attaches also to a bug (*Biporus bibax*), which is very active during the hot months when the disease becomes most noticeable.

A bacterial disease of *Erodium* and *Pelargonium*, I. M. LEWIS (*Phytopathology*, 4 (1914), No. 4, pp. 221-232, pl. 1).—This disease is said to have been first described by Heald and Wolf from the vicinity of San Antonio, Texas (*E. S. R.*, 26, p. 645), and subsequent studies confirmed the statement that the spot is caused by bacteria. The author's attention has been called to it not only on *Pelargonium*, but also as producing a spot on the leaves of *E. texanum*.

The spots are first reddish-brown in color, but soon change to black, and ultimately the affected tissue becomes dry and the leaf withers and falls away. The organism, to which the name *Bacterium* (*Pseudomonas*) *erodii* n. sp. has

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they may be washed down into wounds by the rain and may thus cause infections."

A list of the literature cited is appended.

A synopsis of economic entomology, W. LOCHHEAD (*Macdonald College, Canada* [1914], pp. 113).—This is a work prepared and printed by the author for use in his classes at Macdonald College, and is divided into four parts. Part 1 (pp. 3-15) deals with the structure, development, etc., of insects in the wide sense; part 2 (pp. 16-32) consists of a field key for the identification of the common insect pests; part 3 (pp. 33-103) gives a concise description of the insects mentioned in part 2, arranged according to their orders; and part 4 (pp. 104-113) deals with the control of insects.

A bibliography of the writings of Professor Mark Vernon Slingerland, M. D. LEONARD (*New York Cornell Sta. Bul.* 348 (1914), pp. 623-651, pl. 1).—In an introduction to this bulletin J. H. Comstock briefly describes the entomological work of the late Prof. Slingerland, which commenced in 1890. Attention is called to his monographic work on a few important insects and the excellence of the illustrations used as a result of his skill in photographing entomological subjects. It is stated that he was the first to make use of the spray calendar.

Popular and technical articles to the number of 755 are listed chronologically beginning with the year 1890.

[Report of studies on entomological problems in South Africa], D. D'EMMEREZ DE CHARMOY (*Reduit, Mauritius: Govt. Ent.*, 1914, pp. 12).—This is a report of studies made during a visit to South Africa, covering a period of 3½ months following November 2, 1913.

Sugar cane pests in the Leeward Islands, H. A. BALLOU (*Imp. Dept. Agr. West Indies Pamphlet* 75 (1914), pp. 8+45, pl. 1, figs. 20; abs. in *Agr. News [Barbados]*, 13 (1914), No. 321, pp. 266, 267).—This paper deals briefly with the important insect enemies of sugar cane.

Citrus fruit insects in Mediterranean countries, H. J. QUAYLE (*U. S. Dept. Agr. Bul.* 134 (1914), pp. 35, pls. 10, figs. 2).—This is a report of observations made during the summer of 1913 while engaged in a survey of citrus and other fruit insects in Mediterranean countries. Because of the important bearing on the possibility of the entrance of the fruit fly with Mediterranean fruit, the paper includes a report on harvesting and marketing conditions of citrus fruit, more particularly as to methods of picking, sorting, curing, and shipping. The observations indicate that there is little danger of fruit fly introduction from the lemon, which is the main citrus importation from Mediterranean countries, but that there is some danger from oranges and certain other fruits at particularly favorable seasons of the year.

The species discussed are the Mediterranean fruit fly (*Ceratitis capitata*), black scale, *Chrysomphalus dictyospermi*, purple scale, the long scale, *Parlatoria zizyphus*, the oleander scale (*Aspidiotus hederæ*), cottony cushion scale, citrus mealy bug, *Prays citri*, red spiders, thrips, and the olive fly (*Dacus oleæ*).

Combating insects injurious to orchards and vineyards by means of seaweed mucilage, JSSLEIB (*Ztschr. Pflanzenkrankh.*, 24 (1914), No. 2, pp. 78, 79).—The author believes the employment of seaweed mucilage, prepared by boiling 4 lbs. of Irish moss or Iceland moss in 20 gal. of water for one hour, to be a new and promising method for controlling many fruit pests.

The insecticidal value of fluid extract of larkspur seed, J. B. WILLIAMS (*Amer. Jour. Pharm.*, 86 (1914), No. 9, pp. 414-416).—A number of fluid extracts were prepared, using various menstrua, with a view to determining the constituent of larkspur seed (*Delphinium ajacis*) to which it owes its insecticidal properties, and the best means of extracting the same. The resulting fluid

extracts were assayed for alkaloidal content and also for fixed oil, and their insecticidal value determined by tests on *Cimex lectularius*.

The results indicate "that it is the oil and not the alkaloid to which larkspur seed owes its insecticidal properties, and, since the fluid is seldom used internally but almost exclusively as an insecticide, it would seem that the menstruum that will extract the largest amount of oil is the proper one to use. It should be noted, however, that the alkaloid has a slight insecticidal value, as the sample containing 1 per cent of alkaloid and no oil was one-tenth as active as the samples containing a high content of oil."

The eggs and nymphal stages of the dusky leaf bug *Calocoris rapidus*, R. L. WEBSTER and D. STONER (*Jour. N. Y. Ent. Soc.*, 22 (1914), No. 3, pp. 229-234, fig. 1).—During the course of studies of the insect enemies of the potato, at the Iowa Experiment Station in 1913, the author found *C. rapidus* to occur rather abundantly on potato plants. Further investigations led to the discovery that both the nymphs and adults caused the growing tips to wilt as a result of their attack. Adults confined in insectary cages readily deposited eggs in potato stalks, usually placing them in the tissue at the junction of the smaller stems with the main stalk and in the axils of the leaves. Insectary records show that from 11 to 13 days were required during the latter half of July and the first half of August for the eggs to hatch. Five nymphal stages are described. There appear to be two generations in the latitude of Ames, the second maturing during September. The winter is passed in the adult stage.

A new insect pest of stored potatoes, H. L. DUTT (*Agr. Jour. Bihar and Orissa [India]*, 1 (1913), No. 2, pp. 139-141, pl. 1).—A hemipteran of the family Tingidae is said to be a source of injury in two villages through puncturing and sucking the sap of potatoes in warehouses.

Notes on the green spruce aphid (*Aphis abietina*), F. V. THEOBALD (*Ann. Appl. Biol.*, 1 (1914), No. 1, pp. 22-36, figs. 10).—Spruce trees of various kinds were very severely attacked during 1913 by this aphid, previous to which year the author had not known it to do serious injury. Systematic, biologic, and economic notes are here presented. It is stated that winter treatment with strong paraffin jelly gave excellent results and probably will prove to be the best method of treatment.

Contribution to the knowledge of the oak phylloxera, M. HOLLRUNG (*Kühn Arch.*, 5 (1914), pp. 347-382, figs. 5).—This paper deals with the life history and habits of *Phylloxera quercus* with references to the literature on the subject.

On the preparation of Coccidæ for microscopical study, E. E. GREEN (*Ann. Appl. Biol.*, 1 (1914), No. 1, pp. 98-106).—The author describes the technique necessary in the study of scale insects.

A new *Lachnodium* in Madagascar, P. VAYSSIÈRE (*Bul. Soc. Ent. France*, No. 5 (1914), pp. 156, 157; abs. in *Internat. Inst. Agr. [Rome]*, Mo. *Bul. Agr. Intel. and Plant Diseases*, 5 (1914), No. 7, p. 963).—The coccid *Lachnodium greeni* n. sp. occurs in clusters on the roots and stems of coffee, covered over by cells of earth and bark made by ants, and is a serious coffee pest.

A new coccid infesting citrus trees in California, R. E. CAMPBELL (*Ent. News*, 25 (1914), No. 5, pp. 222-224).—A new soft scale discovered on citrus trees near Claremont, which appears to be closely related to *Coccus hesperidum*, is described as *C. citricola* n. sp. The species is said to have increased in abundance since first discovered and to have been found in a number of other localities.

The alfalfa caterpillar, V. L. WILDERMUTH (*U. S. Dept. Agr. Bul.* 124 (1914), pp. 40, pls. 2, figs. 20).—This is a report of studies of *Eurymus eurytheme* carried on since 1910 in the Southwest, where the caterpillars of this butterfly

damage irrigated alfalfa nearly every year. A preliminary report based upon studies made in 1910 has been previously noted (E. S. R., 25, p. 53).

The species occurs throughout the United States west of the Alleghenies, and in a few cases to the east and ranges northward as far as Hudson Bay. Technical descriptions are given of its several stages and an account of its life history and habits. The egg stage has been found to vary under ordinary temperatures from 2 to 15 days, the normal period being about 6 days. The larva often completes its growth within 12 days, after molting four times and increasing from less than one-tenth to nearly $1\frac{1}{2}$ in. in length. The average length of the pupal period for ordinary field temperatures is from 7 to 10 days. At Tempe, Ariz., never more than 200 eggs were recorded from one female, whereas specimens sent to New Hampshire deposited as many as 500 eggs during a laying period of 11 days, thus illustrating the influence of temperature on egg production. The complete life cycle for this insect averages about 38 days for all generations, the minimum length being about 26 days for the third brood, and the maximum 64 days for the first brood. In the colder sections of the country there are two generations, and in the extreme warmer sections at least six and possibly more generations each year.

The natural enemies of the pest include *Trichogramma minutum*, which parasitizes the egg; four hymenopterans, namely, *Limnerium* n. sp., *Apanteles* (*Protopanteles*) *flavicombe*, *Chalcis ovata*, and *Pteromalus euryymi* and the dipterans *Phorocera claripennis* and *Aphiochæta perditæ*, which parasitize the larva and pupa; and several predators, including the bollworm, which is predaceous on the larva and pupa and prefers such food to alfalfa, the malachiid beetle *Collops vittatus*, the adult of which feeds on the caterpillars and pupæ, the asilids *Proctacanthus milbertii* and *Stenopogon picticornis*, and several species of ants. A disease caused by an undescribed *Fusarium* and a bacterial disease are said to cause a high mortality among the larvæ and pupæ, the latter being one of the most important factors looking toward its control. Birds and domestic fowls, including turkeys, are also mentioned as important enemies.

Studies of control measures have led to the following general directions: Keep the ranch in the best possible cultural condition; irrigate often and thoroughly and as soon after cutting as the crop of hay can be removed from the ground; renovate the field every winter and during the month of August, or even oftener if possible, either by disking or by the use of an alfalfa renovator, and cut the alfalfa close to the ground and clean, especially along the ditch banks, borders, etc.

"Cut the alfalfa earlier than is the general rule. The proper time is when it is just coming in bloom or is one-tenth in bloom. Watch for caterpillars in the early spring crop, and if many are observed about grown, cut the hay a few days before it is in bloom, and thus save the next and future crops. A minimum amount of damage occurs in fields that are systematically pastured all or a part of the time.

"A field should never be abandoned because the caterpillars threaten the destruction of a crop of alfalfa before the hay can possibly mature. Mow it at once, cutting it low and clean, thus saving part of the present crop, and in so doing starve, and allow the heat of the sun to kill, a great many of this generation of worms. Follow this by disking and then by either rolling or brush dragging, and a great majority of any remaining larvæ will be killed. The ground should then be thoroughly irrigated, and by these efforts the coming crop will be assured. Turkeys and chickens when allowed the run of a field will keep the numbers of the caterpillars at a minimum."

Surface caterpillar on Mokameh Tal, E. J. WOODHOUSE and H. L. DUTT (*Agr. Jour. Bihar and Orissa [India]*, 1 (1913), No. 2, pp. 78-104, pls. 4).—This

article describes the results obtained from hand picking and trapping *Agrotis* in 1912, which resulted in a reduction of the damage to crops. The Andres Maire trap imported from Egypt was found to catch large numbers of the moths. See also a previous note (E. S. R., 28, p. 455).

The biology of *Feltia* (*Agrotis*) *exclamationis* and of *Euxoa* (*Agrotis*) *segetum* according to observations in the Governments of Tula and Tver in 1909–10, N. SACHAROV (*Abs. in Rev. Appl. Ent.*, 2 (1914), Ser. A, No. 4, pp. 211, 212).—A detailed report of observations.

On the parasites of the eggs of *Cydia pomonella* and the investigation of them by A. Radetzky, T. STCHERBAKOV (*Reprint from Zap. Simferopol. Otd. Imp. Ross. Obshch. Sadov.*, No. 140 (1914), pp. 12; *abs. in Rev. Appl. Ent.*, 2 (1914), Ser. A, No. 4, p. 263).—A polemic article relative to the codling moth. See also a previous note (E. S. R., 31, p. 62).

Repellents for protecting animals from the attacks of flies, H. W. GRAYBILL (*U. S. Dept. Agr. Bul.* 131 (1914), pp. 26).—Following a review of the literature the author reports the results of experimental tests of various substances or mixtures for repelling flies. The results obtained have been summarized as follows:

“A 10 per cent mixture of crude carbolic acid (21.8 per cent phenols) in cotton-seed oil has a very strong repellent action on flies, but this lasts less than a day, in consequence of which it is necessary to apply the mixture every day. The mixture should be applied lightly with a brush, since a heavy application with a spray pump is likely to cause phenol poisoning.

“Mixtures consisting of 10, 20, and 50 per cent of pine tar in cotton-seed oil have marked repellent qualities. They should be applied lightly, and it is necessary to apply them every day. A liberal application of a 10 per cent mixture is deleterious to animals. This is also the case with a half-and-half mixture of pine tar and Beaumont oil when applied lightly with a brush.

“A mixture of oil of tar (14 per cent phenols, volatile with steam) in cotton-seed oil and in Beaumont oil has a very marked repellent action. A 10 per cent mixture of oil of tar in cotton-seed oil is safe. A half-and-half mixture of oil of tar and cotton-seed oil when applied liberally with a spray pump and 50 per cent oil of tar in Beaumont oil applied with a brush are not safe. Ten per cent oil of tar in Beaumont oil is safe. When applied lightly it is necessary to apply 10 per cent oil of tar in cotton-seed oil or 10 per cent oil of tar in Beaumont oil every day. Mixtures of 10 per cent of oil of citronella, oil of sassafras, or oil of camphor in cotton-seed oil are powerful repellents, but they are active for less than a day.

“A heavy application of fish oil causes the hair to become sticky and fall out. A light application did not produce these results. Pyrethrum powder is an effective repellent, but its action lasts only for about a day.”

A list of 22 titles of the literature referred to is appended.

On the biology of *Trichomyia urbica*, a psychodid, the larva of which is xylophagous, D. KELLIN (*Compt. Rend. Soc. Biol. [Paris]*, 76 (1914), No. 10, pp. 434–437, figs. 2).—The larva of this dipteran, unlike all other known species of the family, is said to be xylophagous. It is found in galleries of old felled trees eating the wood.

The *Phlebotomus papatasi*, the transmitter of the “three days fever,” R. MORALES (*Escuela Med. [Guatemala]*, 1914, Feb.; *abs. in Amer. Jour. Trop. Diseases and Prev. Med.*, 1 (1914), No. 12, pp. 815–818).—It is stated that in Guatemala *P. papatasi* is the transmitting agent of the filterable virus that produces the “three days fever.”

A flagellate infection of sand flies, F. P. MACKIE (*Indian Jour. Med. Research*, 2 (1914), No. 1, pp. 377–379, pl. 1).—“Ten per cent of female sand flies

(*Phlebotomus minutus*) were found to be infected with a flagellate of the genus *Herpetomonas*. It is probably a natural parasite of the fly and is not likely to have any relation to the occasional habit of *Phlebotomus* as a human bloodsucker. The natural host of *P. minutus*, as Howlett has shown, is probably the common wall lizard. As I can not find that the flagellate has been previously described, I suggest for it the name *Herpetomonas phlebotomi* n. sp."

New investigations of the life history of the two warble flies of cattle, H. GLASER (*Mitt. Ausschusses Bekämpf. Dasselplage*, No. 5 (1913), pp. 5-38; *abs. in Internat. Inst. Agr. [Rome]*, *Mo. Bul. Agr. Intel. and Plant Diseases*, 5 (1914), No. 3, pp. 376, 377).—The author here reports upon further investigations (E. S. R., 29, p. 761) of the life history of *Hypoderma bovis* and *H. lineata*. In experiments conducted in order to determine if the larvæ of the two warble flies are able to penetrate the skin of man and of animals, negative results were obtained with cattle but in man in one case a larva penetrated the skin of the thigh.

The typhoid fly and its associates, T. J. HEADLEE (*New Jersey Stas. Circ.* 37 (1914), pp. 3-8).—A popular account, including observations as to the seasonable appearance of flies in dairy and horse barns and pig and poultry plants.

A new sarcophagid parasite of grasshoppers, E. O. G. KELLY (*U. S. Dept. Agr., Jour. Agr. Research*, 2 (1914), No. 6, pp. 435-446, pl. 1).—This paper reviews the literature relating to the parasitic species of the dipterous family Sarcophagidæ and reports investigations carried on by the Bureau of Entomology of this Department, particularly in Kansas.

The studies have shown that sarcophagid larvæ are placed on the underside of the unfolded posterior wings of the flying grasshopper, the striking of the wing by the fly probably causing the sudden dropping of the victim that has been observed. After having been deposited on the unfolded wings of the grasshoppers the maggots crawl toward the base of the wing, using the sides of the fold for a trough in which to travel. In this way they reach the base of the wing and the metathorax, where the body is quite soft and moist, and enter the body to feed upon the internal vital organs. Some of the maggots are deposited on segments of the abdomen and these enter through the segmental divisions. They develop rapidly, maturing in from 10 to 30 days. After becoming full grown the larvæ crawl from the body of the grasshopper and enter the soil to a depth of from 2 to 6 in., where they pupate. It is stated that nearly 1,200 sarcophagids of several species issued from the bodies of some 800 dead grasshoppers collected during the fall of 1912. Adults began to issue about the middle of February and continued to do so until early May. There appear to be five or six generations each year.

Sarcophaga kellyi n. sp., a description of which by J. M. Aldrich is appended, was the species upon which the observations were largely made. Several other less abundant species were observed in the act of larvipositing on grasshoppers and were subsequently reared from them during these investigations, notably, *S. cimbicis*, *S. sarracenix* and *S. hunteri*, and in addition to these *S. helicis* was reared from the dead grasshoppers. Several parasites of the sarcophagid puparia were reared, including *Perilampus hyalinus*, *Chalcis coloradensis*, *Aphareta* sp., and *Eupteromalis* sp.

Papaya fruit fly, F. KNAB and W. W. YOTHERS (*U. S. Dept. Agr., Jour. Agr. Research*, 2 (1914), No. 6, pp. 447-454, pls. 2).—*Toxotrypana curvicauda* was first brought to the attention of this Department as occurring in Florida in December, 1905, when infested fruit was received from Miami. It was again reported during the summer of 1912 from the same locality. The increasing commercial importance of the papaya led to an investigation during

the fall of 1912 of its distribution, life history, and habits. In that year it was found to infest both wild and cultivated papayas as far north as Miami from which it has since spread northward to Palm Beach, where in 1914 it was reported as having been very destructive. It was also found to infest the papaya on the island of New Providence which lies some 200 miles east of Miami. Earlier records show it to occur in Yucatan, Costa Rica, Panama, Porto Rico, island of St. Jean, and several South American countries. Technical descriptions are given of its several stages.

"To determine the amount of infestation in the wild fruits of different sizes or ages, an examination was made of small fruits about 0.75 in. in diameter, medium-sized fruits, and large ripe fruits. Out of 208 small fruits, 41 showed infestation, and 167, or 80 per cent, were sound. Out of 52 medium-sized fruits 26, or 50 per cent, were free from infestation. Examination of 25 nearly ripe fruits showed that none were sound. Again, in a miscellaneous lot of 63 fruits, 32 or over 50 per cent, were infested. In general, small or young fruit is much less infested than the older fruit, the flies evidently selecting the larger and more mature fruits for oviposition."

The occurrence of dead full-grown larvæ in fruits externally sound led to the discovery that contact with the juice of the unripe fruit is quickly fatal to the larvæ.

Observations of the pupal period made in the cool season of the year show a variation of from 30 to 42 days.

The means of control that now seem valuable are the production of varieties of papaya that have thick meat and that ripen slowly, and the destruction of adventitious or wild papaya plants and of all infested fruits.

An account of studies of this pest in Porto Rico has been previously noted (E. S. R., 29, p. 652).

Mosquitoes and malaria, C. W. STILES (*Pub. Health Rpts. [U. S.] 29 (1914), No. 36, pp. 2301-2311*).—The results of an inspection of both rural and municipal communities in eastern North Carolina emphasize the necessity of removing or destroying mosquito-breeding places such as tin cans, boxes, buckets, and other receptacles capable of holding water.

The behavior of the parasite of Indian kala-azar in the dog flea, *Ctenocephalus felis*, with some remarks on canine kala-azar and its relation to the human disease, W. S. PATON (*Indian Jour. Med. Research, 2 (1914), No. 1, pp. 399-403*).—"The parasite of Indian kala-azar does not develop in the dog flea, *C. felis*, but degenerates and disappears in eight hours. This together with the fact that the dog has not been found infected with kala-azar, or perhaps to be exact herpetomoniasis, in India, strongly supports the view that human kala-azar is not of canine origin. The human flea, *Pulex irritans*, has not been found in Madras."

A bacterial disease of the larvæ of the June beetle, *Lachnosterna* spp., ZAE NORTHRUP (*Michigan Sta. Tech. Bul. 18 (1914), pp. 5-37, figs. 22*).—This bulletin deals with a disease of white grubs, particularly prevalent during the season of 1912, which is caused by a new species of *Micrococcus* found microscopically in smears and in sections from diseased tissue, and in almost pure culture on agar plates made from diseased portions of the living grub. This micrococcus, which seems to enter the class with *Micrococcus hæmorrhagicus* and has been named *M. nigrofaciens*, is frequently accompanied by a gas-producing bacillus from which it is separated with difficulty.

"The micrococcus exists in soil and is present in many soils in Michigan, Illinois, Maryland, North Carolina, and most probably in other States and countries. This micro-organism grows well on ordinary media, but much better on

larva media (gelatin, agar, broth, and larva itself). It stains well with ordinary aqueous-alcoholic stains, showing clearly the dividing cells; is not acid-fast but is Gram positive. The disease was successfully reproduced in a healthy larva of the same species by placing the larva in artificially infected soil, making an incision in the integument. Parasitic insects or fungi, or the larvæ themselves may add materially to the chance of infection by producing a predisposition to the disease through mere mechanical injury. The characteristic lesions were also produced in several healthy specimens of *Allorhina nitida* by merely placing them in water-soaked, sterilized soil to which a broth suspension of the micrococcus had been added. Individual larvæ of one genus seem to vary greatly in their power of resistance to the micrococcus, the younger seeming to be the more susceptible. Larvæ of the genus *Lachnosterna* seem to be less resistant than those of the genus *Allorhina*. Stained sections made from the diseased portions of larvæ demonstrate the micrococci, unstained but dark brown in color, imbedded in the laminæ (also unstained and brownish in color) of the integument. Large light brown pigmented cells also are found within the body cavity. This brownish-black color is due to a pigment presumably melanotic in character, most probably directly or indirectly produced by the activity of the bacterial cells within the larval tissue. This micrococcus was found to be pathogenic to the cockroach *Periplaneta americana* also, the disease pursuing its course in much the same fashion as in the white grub, the infection, however, apparently limiting itself to the legs. It can not be definitely stated whether the micrococcus is pathogenic to angleworms. Several unsuccessful attempts were made in isolating the micrococcus from naturally infected soil. Excessively wet soil favors the progress of the disease. In fact this factor may be considered as probably the most important one concerned in the fatality of the infection.

"Other organisms existent in the soil may cause an infection of the larvæ. A gas-producing bacillus (*Bacillus septicus insectorum*?) found on the plate cultures seems to add materially to the fatality of the disease under certain conditions. This bacillus may be the primary invading organism."

A bibliography of 29 titles is appended.

A bacterial disease of the larvæ of the June beetle, *Lachnosterna* spp., ZAE NORTHRUP (*Centbl. Bakt. [etc.]*, 2. Abt., 41 (1914), No. 11-17, pp. 321-339, pls. 4, figs. 5).—The data here presented are substantially noted above.

Boll weevil effect upon cotton production, W. E. HINDS (*Alabama Col. Sta. Bul.* 178 (1914), pp. 87-99, fig. 1).—The author here discusses a number of factors in the natural control of the weevil, among them climatic conditions, including temperature and humidity and cotton worm effects. It is pointed out that no section of Alabama can hope to escape weevil infestation, and that while greater profits may be expected in the zone with from 12 to 14 in. of rainfall per annum than farther south, even here diversification should be encouraged.

A map illustrating the spread of the weevil and rainfall zones is included.

On Stylops and stylopisation, G. SMITH and A. H. HAMM (*Quart. Jour. Micros. Sci. [London]*, n. ser., 60 (1914), No. 239, pp. 435-461, pls. 4).—"From a study of the anatomy and life history of Stylops it appears that despite the existence of active winged males, fertilization can not occur and development is always parthenogenetic. . . . The effect of the parasite on the internal genital organs is slight as compared with the effect of *Sacculina* on *Inachus*, and leads to a reduction in the size of the ovaries to about quarter the normal size, while the testes are usually unaffected. The ovaries of stylopised bees never produce ripe ova, but the testes generally produce normal ripe sper-

matozoa. . . . The scopa of the parasitized female is generally reduced in size, and she never or very rarely collects any pollen."

The geographical distribution of our common red spider, *Tetranychus telarius*, H. E. EWING (*Jour. Ent. and Zool.*, 6 (1914), No. 3, pp. 121-132, fig. 1).—A detailed report on the distribution of this pest, including a map which shows its known distribution in the United States. The author concludes that Europe is probably the native home of this mite.

The muscardines; genus *Beauveria*, J. BEAUVERIE (*Rev. Gén. Bot.*, 26 (1914), Nos. 303, pp. 81-105; 304, pp. 157-173, figs. 19).—A general discussion of the muscardines, the practical utilization of the entomophytic fungi, and the botanical characters of the silkworm muscardine (*Beauveria* [*Botrytis*] *bassiana*) and of several other species.

A bibliography of 47 titles is appended.

FOODS—HUMAN NUTRITION.

Preservation of commercial fish and fishery products in the Tropics, A. SEALE (*Philippine Jour. Sci., Sect. D.*, 9 (1914), No. 1, pp. 1-17, pls. 2).—Preserving by drying and salting, smoking, marinating, canning, and by low temperature or refrigeration is considered as well as the preparation of fish for shipment. Philippine conditions are discussed and details of methods of preservation quoted, in a number of cases the material being taken from the reports of the United States Fish Commission.

Cows' butter and its substitution with artificial products, A. O. WEBER (*Vrachebnaya Gaz. [St. Petersburg]*, 19 (1912), No. 4, pp. 180, 181).—This article deals with the composition of butter and some of its substitutes in the diet.

The author concludes that the substitution of artificial products for butter is desirable from the standpoint of health as well as economy. Preparations of vegetable fats, particularly those from coconuts, are deemed especially suitable for foods, owing to their cheapness, ease of use, and ready assimilation. From a summary of clinical observations it is concluded that the use of coconut butter as the source of fat in the diet of tuberculous patients gives very satisfactory results on account of its ease of assimilation.

The composition and quality of Mexican wheats and wheat flours, C. H. BAILEY (*Jour. Amer. Soc. Agron.*, 6 (1914), No. 2, pp. 57-64).—General and analytical data are presented and discussed.

[Deficiency of gluten in French wheats], M. LINDET (*Bul. Soc. Nat. Agr. France*, 74 (1914), No. 5, pp. 563-569).—A digest of data in which the author maintains that the deficiency of gluten is due to the effect of the climate upon the wheat, particularly during the ripening period, rather than to the effects of cultural conditions. The paper is followed by a discussion.

Decline in gluten of bread flour, J. P. WAGNER (*Deut. Landw. Presse*, 41 (1914), No. 47, p. 575).—A summary and digest of data.

Physical factors which influence the percentage of wet and dry gluten in wheaten flour, B. H. KEPNER (*Jour. Indus. and Engin. Chem.*, 6 (1914), No. 6, pp. 481, 482).—According to the author's conclusions, conditions vary so much that different determinations of wet gluten made in various laboratories are not comparable.

Thoroughness of mixing affects the percentage of both wet and dry gluten. An excess of water used in making the doughs increases, and insufficient water decreases, the percentage of wet gluten, the percentage of dry gluten being unaffected.

Up to eight hours the length of time dough is allowed to stand increases the percentage of wet gluten. "High patents, old flours, and low grades are excep-

tions. The dry gluten remains unaltered except in the low grade where some fermentation has taken place.

"Overwashing decreases the percentage of both the wet and dry gluten.

"A larger percentage of wet gluten is obtained with warm wash water than with cold. The dry gluten is unaffected.

"More wet gluten is obtained with 'hard' wash water than with soft. The dry gluten is slightly increased by the hard water."

Flour, A. MCGILL (*Lab. Inland Rev. Dept. Canada Bul.* 279 (1914), pp. 17).—Analytical data are given regarding 139 samples of market flour purchased in the various provinces of the Dominion.

Notes on "sharpes," J. F. LIVERSEEGE and G. D. ELSDON (*Analyst*, 39 (1914), No. 459, pp. 251, 252).—Analytical data are presented and discussed, especially with reference to the calcium content of sharpes.

Wider use of corn for food in Philippines, J. F. BOOMER (*Daily Cons. and Trade Rpts.* [U. S.], 17 (1914), No. 135, p. 1450).—An increase in the consumption of corn as a substitute for rice is noted.

The composition and food value of fresh soy beans, P. MOLLIEUX (*Ann. Chim. Analyt.*, 19 (1914), No. 6, pp. 217-219).—Analytical and general data are given.

Roselle recipes, reported by P. J. WESTER (*Philippine Agr. Rev.* [English Ed.], 7 (1914), No. 5, pp. 239-241).—Recipes are quoted from a pamphlet recently published by E. L. Worcester.

[Coffee consumption and modes of grinding in foreign countries], J. B. OSBORNE, W. H. GALE, A. HALSTEAD, H. L. WASHINGTON, E. L. ADAMS, and W. DAWSON, JR. (*Daily Cons. and Trade Rpts.* [U. S.], 17 (1914), No. 141, pp. 1642-1646).—Data are given regarding the extent of consumption and the various methods of grinding, with special reference to the introduction of electric coffee grinders into France, Greece, England, Ireland, and Argentina.

Tea, A. MCGILL (*Lab. Inland Rev. Dept. Canada Bul.* 287 (1914), pp. 15).—Data are given regarding the examination of 149 samples of tea. Most of the samples yielded more than the 30 per cent extractive required, many of them giving from 36 to 40 per cent. "Facing is indicated in 13 samples, but is so slight as to be disregarded from the point of view of harmfulness.

"On the whole, this report may be taken to prove that there is no noteworthy adulteration of tea in Canada."

Temperance beverages or soft drinks, A. MCGILL (*Lab. Inland Rev. Dept. Canada Bul.* 280 (1914), pp. 21).—Data are given regarding the inspection and analysis of 150 samples, collected in the various districts of Canada.

[Water for drinking and cooking purposes supplied to ships] (*Pub. Health Rpts.* [U. S.], 29 (1914), No. 24, p. 1485).—An amendment to the quarantine regulations forbids the furnishing of ships with polluted water for cooking or drinking purposes.

Water for cooking and preserving purposes, J. C. SMITH (*Pure Products*, 10 (1914), No. 7, pp. 351-354).—In this article the author presents data showing the condition of a number of samples of water used in canning factories, and emphasizes the necessity for the purity of such supplies, both from the standpoint of freedom from spore-forming bacteria and of chemical impurities such as traces of iron, manganese, ammonia, or hydrogen sulphid.

Report of the committee on sanitation (*Nat. Canners Assoc. Ann. Conv.*, 7 (1914), pp. 7).—Among the subjects considered are the sanitation of the building site and grounds, buildings, water supply, and similar topics, as well as personal hygiene of the employees.

Sanitation of canning factories (In *A Complete Course in Canning*. Baltimore, Md., 1914, 3, ed., pp. 23-26; *Pure Products*, 10 (1914), No. 6, pp. 274-277).—See above.

[Food inspection work], W. B. BARNEY (*Iowa Dairy and Food Com. Bul.* 9 (1914), pp. 47).—This report contains general data regarding a number of pure food topics. Information is also given regarding the inspection of a number of food establishments and the examination of several samples of food products.

Dunn's pure food and drug legal manual, edited by C. W. DUNN (*New York, 1912, pp. XXVI+2347*).—A compilation of the federal and state laws relating to food and drug control.

The fruit and vegetable canning industry of New Jersey—season of 1912 (*Ann. Rpt. Bur. Statis. Labor and Indus. N. J., 36 (1913), pp. 165-174*).—Statistical data are reported and discussed.

The farm kitchen as a workshop, ANNA BARROWS (*U. S. Dept. Agr., Farmers' Bul.* 607 (1914), pp. 20, figs. 6).—Such subjects are discussed in a general way as the relation of the kitchen to other parts of the house; the size of the kitchen; the finishing of floors, walls, and ceiling; lighting, ventilating, and heating; porches and screening; permanent equipment of the kitchen; and the kitchen as a laundry. Particular attention is given to the arrangement of the kitchen stove, cooking table, and other kitchen equipment, so that the journeys more frequently made in doing the kitchen work are short. The importance of adequate equipment is pointed out and suggestions made for labor-saving equipment and expedients.

Electric cooking and heating, V. NIGHTINGALL (*Aust. Min. Standard*, 48 (1912), Nos. 1245, p. 280; 1246, p. 305; 1247, p. 328; 1248, p. 350, fig. 1).—This paper deals somewhat at length with the factors upon which economical electric cooking depends, and especially with the development of the hot plate and the electric oven. Nichrome is recommended as the most satisfactory material for the wires and green Australian mica as the best material for the insulator and support in the manufacture of the heating units.

The author emphasizes the necessity for securing simplicity in operation of electric cooking devices and the need of providing some device for protecting them against burnouts. For the latter purpose he recommends a bulb lamp of clear glass, placed in parallel with the circuit at the wall plug.

Slag wool and flaked mica are recommended as the best thermal insulators for oven construction, the greatest thermal efficiency being obtained when the sides and bottom of the oven were provided with 3½ in., the top with 4½ in., and the door with 4½ in. of lagging. All thick iron parts in the interior of the oven should be replaced by sheet-iron frames.

It is recommended that the oven be equipped with a thermostat. A description is given of a mercury thermostat which gave great satisfaction.

If electric hot plates are heated too rapidly, stews, etc., burn. Therefore, the use of specially designed quick-heating kettles for boiling water is recommended. The suggestion is advanced that water could be heated during the night when the current consumption is low, and stored in insulated tanks for use during the daytime.

The American waiter, J. B. GOINS (*Chicago, 1908, 2. ed., rev. and enl., pp. 152, figs. 44*).—While this book is intended primarily for the instruction of waiters in hotels and restaurants, it contains a great deal of information concerning the arrangement of the table, care of equipment, preparation of food for the table, and service, which would prove valuable to the housewife.

Experimental domestic science, R. H. JONES (*Philadelphia, pp. IX+235, figs. 75*).—This book deals with physics and chemistry as applied in the household. It has been the author's purpose either to illustrate scientific principles by numerous simple experiments which may be easily performed and in most cases require the use only of kitchen utensils and commodities or to draw illus-

trations from everyday experiences. Among the subjects treated somewhat at length are the chemistry and physics of cooking, bread making, and cleaning. In one chapter a number of popular domestic misnomers and fallacies are explained or disproved.

The history of dietetics, J. B. NICHOLS (*Pop. Sci. Mo.*, 83 (1913), No. 5, pp. 417-427).—Interesting historical data are summarized.

Concerning modern food reforms, M. RUBNER (*Über moderne Ernährungsreformen. Munich and Berlin, 1914*, pp. 83; *abs. in Zentbl. Physiol.*, 28 (1914), No. 6, pp. 350, 351).—The author examines critically some of the modern theories of diet reform particularly a protein diet. He holds that the older dietary standards with larger amounts of protein are more desirable.

Protein metabolism after hunger and the absorption of greater quantities of protein similar to and different from body protein, C. G. L. WOLF (*Biochem. Ztschr.*, 63 (1914), No. 1, pp. 58-73).—Experiments are reported in which a laboratory animal (a dog), which had previously been fasting, was maintained for eight days upon a diet of beef heart. After another fasting period of eight days, the dog was then fed for a period of eight days upon dog flesh. The results indicate a greater absorption of food material from the diet of dog flesh than from that of beef heart, and in the opinion of the author support the contention that the individual proteins of the body are better utilized than foreign proteins.

The protein requirement and the price of meat, DECKER (*München. Med. Wchnschr.*, 61 (1914), No. 16, pp. 870-872).—The work of the principal advocates of a low protein diet is here summarized from the standpoint of health and economy. The author concludes that the minimum daily protein requirement for a man not engaged in hard manual labor should be 60 gm., one-third of which should consist of vegetable protein.

Family budgets of Danish workingmen's families.—I, Workers in cities; II, Workers in rural districts; III, Farmers (*Danmarks Statis. Meddel.*, 4. ser., 40 (1912), pt. 1, pp. 113; 40 (1913), pt. 2, pp. 77; 40 (1914), pt. 3, pp. 173).—A large amount of data are given regarding the income and expenses of a number of families in each group.

The care and feeding of children, MARY E. FRAYSER (*Winthrop Norm. and Indus. Col. S. C. Bul.*, 7 (1914), No. 3, pp. 36, figs. 9).—Clothing, care, and feeding of infants and similar topics are discussed. Recipes are included as well as directions for modifying milk.

How to keep your baby well (*Washington, D. C.: Health Dept.*, 1914, pp. 7).—Advice is given regarding the feeding and clothing of infants and similar topics.

Some principles of infant feeding, H. L. K. SHAW (*Mo. Bul. N. Y. State Dept. Health*, 30 (1914), No. 5, pp. 154-156, fig. 1).—A brief digest of data.

Adaptation of the gastric juice to the coagulation and digestion of milk in the case of nurslings, L. GAUCHER (*Compt. Rend. Soc. Biol. [Paris]*, 76 (1914), No. 9, pp. 389, 390).—Experiments are reported in which some of the children were breast-fed, others fed upon cows' milk, while still another portion received a mixed diet.

From the results of his experiments, the author concludes that the gastric juice is capable of adapting itself to the method of feeding to which it is subjected. In the case of artificial feeding, the quantity of gastric juice secreted was greater than in the case of breast feeding.

Practical study of goat's milk in infant feeding as compared to cow's milk, D. H. SHERMAN and H. R. LOHNES (*Jour. Amer. Med. Assoc.*, 62 (1914), No. 23, pp. 1806, 1807).—Experimental data and clinical observations are reported, but no definite conclusions are drawn. Examination of the stomach contents after test meals showed, in general, a slower digestion of the cow's milk with the

formation of smaller and more flocculent curds than in the case of the goat's milk. In the case of 16 clinical observations, 12 cases gained more rapidly upon modified cow's milk while 4 gained more rapidly upon modified goat's milk.

Is polished rice plus vitamin a complete food? C. FUNK (*Jour. Physiol.*, 48 (1914), No. 2-3, pp. 228-232).—Feeding experiments with birds are reported in which was studied the effect of adding the vitamin fraction from yeast to a diet of polished rice. The author draws the following conclusions:

"The experiments show conclusively that polished rice and vitamin constitute a complete food.

"There is no justification at the present moment to accept the necessity of two different vitamins, one for curing the nervous symptoms and one for maintenance of body weight.

"The vitamin fraction used in the above experiments being entirely free from phosphorus we are justified in saying that the physiological importance ascribed in late years to lipoids and substances soluble in lipoid solvents as regards their bearing on deficiency diseases must not be attributed to lipoids, but to vitamins which are accidentally extracted in the same process."

The vitamins, P. G. STILES (*Sci. Amer. Sup.*, 77 (1914), No. 2008, p. 420).—A digest of data.

Nerve degeneration in fowls fed on unhusked rice (Palay), R. B. GIBSON and ISABELO CONCEPCION (*Philippine Jour. Sci., Sect. B*, 9 (1914), No. 1, pp. 119-123, pls. 1).—The results obtained by the authors seem to indicate that "the substitution of rough rice for the polished article can not be completely protective against beri-beri in all individuals. We do not mean to say that this substitution has not practically eliminated beri-beri where it has been undertaken or that the use of rice polishings is not without great therapeutic value. But in view of the accumulated evidence, we can say that the addition of other foodstuffs to a diet of unpolished rice is essential to meet the normal nutritive requirements of the body."

The etiology of pellagra, J. GOLDBERGER (*Pub. Health Rpts. [U. S.]*, 29 (1914), No. 26, pp. 1683-1686).—The epidemiological observation that nurses and attendants in institutions where there are numerous cases of this disease are themselves exempt from it may be explained, in the opinion of the author, by the difference in diet. It is pointed out that pellagra is distinctly rural and generally associated with poverty. It has previously been shown by studies of institutional dietaries and dietaries of rural regions that cereals make up a much greater portion of the dietaries of the poorer classes than of the more well-to-do, and while the author does not believe that the consumption of corn or corn products is necessary for the development of pellagra, he believes that the presence of cereals and vegetables in too great a proportion in the diet is objectionable. In conclusion, he urges, on account of the uncertainty as to the true cause of the disease, a "reduction in cereals, vegetables, and canned foods that enter to so large an extent into the dietary of many of the people in the South and an increase in the fresh animal food component, such as fresh meats, eggs, and milk."

The degree of metabolism in various kinds of work, G. BECKER (*Naturwissenschaften*, 2 (1914), No. 23, pp. 558-562).—Experimental data are reported, most of which have been noted from another source (*E. S. R.*, 31, p. 561).

A micro-respiration apparatus and some of the studies made with it of the temperature-metabolism curve of insect pupæ, A. KROGH (*Biochem. Ztschr.*, 62 (1914), No. 3-4, pp. 266-279, figs. 5).—In this article is described a micro-respiration apparatus which consists essentially of a modified apparatus for differential blood gas analysis of the Barcroft type.

ANIMAL PRODUCTION.

Stock feeding, W. H. DALRYMPLE (*Louisiana Stas. Bul. 148 (1914), pp. 3-56*).—This bulletin gives general instructions on the balancing of rations, feeding standards, computing of rations, and systems of feeding, and includes tables giving the composition and digestibility of the principal feeding stuffs, sample rations, etc.

Paille finne grass, S. M. TRACY (*Louisiana Stas. Bul. 147 (1914), pp. 3-7*).—A preliminary reconnaissance survey in cooperation with the Bureau of Plant Industry of this Department and the Louisiana Conservation Commission indicated an acreage in the State of nearly 2,000,000 acres of paille finne grass (*Panicum hemitomum*). Analyses given show a protein content which varies from 5.94 per cent to 9.87, carbohydrates from 41.21 to 45.58, fat from 1.49 to 2.22, fiber from 31.39 to 39.55, and ash from 4.46 to 6.26. The high protein content makes it especially adaptable to stock feeding, and it is used widely by the planters and stock growers in southern Louisiana, who have found that steers may be fattened in six months without having received any grain feed, the pasture alone being sufficient to put the animals in good marketable condition. As a hay it is preferred to timothy and is deemed nearly equal to alfalfa hay in nutritive value.

Coconut meal, J. B. LINDSEY (*Massachusetts Sta. Bul. 155 (1914), pp. 182-190*).—The composition of coconut meal used in these experiments was as follows: Water 9, protein 19.35, fat 9.12, extract matter 48, fiber 8.64, and ash 5.89 per cent. In digestion experiments with two sheep the following coefficients of digestibility were obtained: Protein 90, fat 100+, extract matter 87, fiber 23, and ash 64 per cent. Gluten feed contains about 100 lbs. more digestible nutrients per ton than the coconut meal. The coconut meal contains 88.4 therms of net available energy and the gluten feed 82.7 therms, the difference being due to the higher percentage of fat in the former.

In feeding experiments with 10 dairy cows, in which hay and wheat bran constituted the basal ration and gluten feed and coconut meal the supplementary feeds, substantially the same results in milk yield and slightly more butter fat were obtained from the coconut meal than with the gluten feed ration. In amounts of from 3 to 4 lbs. daily per head, coconut meal is considered to be a desirable dairy feed.

Kafir for feeding, G. K. HELDER (*Kansas Sta. Bul. 198 (1914), pp. 627-632*).—In experiments conducted at the Fort Hays substation, four lots of beef cows wintered during a 100-day period were fed a daily ration as follows: Lot 1, Kafir corn fodder 27.2 lbs., wheat straw 10.28, and cotton-seed cake 1; lot 2, Kafir corn silage 35.63, wheat straw 14.2, cotton-seed cake 1; lot 3, Kafir corn stover 25.6, wheat straw 10.79, cotton-seed cake 1; and lot 4, Kafir corn silage 20.05, wheat straw 17.18, cotton-seed cake 1, costing \$9.91, \$6.30, \$5.61, and \$4.44, respectively, per cow. Average daily gains were made of 0.5, 1.34, 0.35, and 0.56 lbs. per cow. The estimated value of Kafir corn silage was \$2.66, Kafir corn fodder \$5.00, and Kafir corn stover \$3.00 per ton. The yields of the feeds were Kafir corn silage 8.5 tons per acre, Kafir corn fodder 3 tons, and Kafir corn stover 2 tons.

Five lots of 10 beef steers each, wintered at Manhattan during a 100-day period, were fed as follows: Lot 1, corn silage and cotton-seed meal; lot 2, Kafir corn silage and cotton-seed meal; lot 3, sweet sorghum silage and cotton-seed meal; lot 4, corn silage and alfalfa hay; and lot 5, corn stover, shelled corn, and alfalfa hay. Average daily gains were made per head of 1.5, 1.62, 1.58, 1.5, and 1.62 lbs., respectively, and costing \$5.50, \$5.50, \$5.49, \$5.75, and \$5.96, respectively, per head.

From extensive hog-feeding tests at Fort Hays it was concluded that "it is more profitable to full-feed hogs of medium age and weight (125 lbs.) for a short period (75 days) than to full-feed old or very young hogs for a long period. Hogs following cattle require less grain than when fed in separate pens, even though the cattle are fed ground grain. The addition of a few sugar beets to a Kafir corn ration is advisable. It reduces the amount of grain and the cost per pound of gain while it increases the average daily gain of the hogs. Kafir corn and milo maize when fed with the proper concentrates are satisfactory feeds for fattening hogs."

A brief review of other tests (E. S. R., 30, p. 569) is also given.

Raising and fattening beef calves in Alabama, D. T. GRAY and W. F. WARD (*Alabama Col. Sta. Bul. 177 (1914), pp. 71-83, figs. 2*).—The experiments here reported were made in cooperation with the Bureau of Animal Industry of this Department, and are in continuation of earlier work (E. S. R., 25, p. 72). From a herd of 80 grade Aberdeen Angus cows 64 spring calves were raised, which ran with their mothers until late fall when they were weaned and prepared for the fattening period. When the calves were 9½ months old they had attained an average weight of 460 lbs. and cost \$14.36 each. This cost includes the cost of feed for both cows and calves, interest on money invested, rent on pasture, taxes, depreciation on value of herd, etc.

Forty-nine of these calves averaging 456 lbs. each were placed in the feed lot in January and fed for 73 days, receiving daily 4.4 lbs. cotton-seed meal, 23.9 lbs. corn silage, and 2.76 lbs. broom-sedge hay per head. They made an average daily gain of 1.37 lbs. per head, requiring 3.23 lbs. of cotton-seed meal, 17.41 lbs. corn silage, and 2.01 lbs. of hay, and costing 7.31 cts. per pound of gain. It is estimated that it cost 3.61 cts. per pound to raise and fatten the calves. An average profit per head of \$6.81 was realized.

A study of the digestibility of rations for steers with special reference to the influence of the character and the amount of feed consumed, H. W. MUMFORD, H. S. GRINDLEY, L. D. HALL, A. D. EMMETT, W. E. JOSEPH, and H. O. ALLISON (*Illinois Sta. Bul. 172 (1914), pp. 235-285, figs. 7; abs., pp. 3*).—Four lots of two 2-year-old choice feeder steers each were fed for periods of three, four, four, and four weeks each with transitional periods of two and three weeks between each period, as follows: Lot 1 maintenance ration, lot 2 maintenance and one-third feed, lot 3 maintenance and two-thirds feed, lot 4 full feed; the steers receiving during the first period clover hay, ground corn, and oil meal 1:1:0, second period 1:3:0, third period 1:5:0, and fourth period 1:4:1. Digestion and metabolism stalls were provided and the feed intake and outgo weighed and analyzed. The average coefficients of digestibility are shown in the following table:

Coefficients of digestibility of protein, fat, and carbohydrates of mixed rations.

Kind of ration.	Protein.				Fat.				Carbohydrates.			
	First test.	Second test.	Third test.	Fourth test.	First test.	Second test.	Third test.	Fourth test.	First test.	Second test.	Third test.	Fourth test.
Maintenance ration...	P. ct. 45.5	P. ct. 49.4	P. ct. 52.7	P. ct. 70.3	P. ct. 73.6	P. ct. 79.0	P. ct. 86.2	P. ct. 84.4	P. ct. 74.9	P. ct. 81.9	P. ct. 82.6	P. ct. 83.0
Maintenance ration plus one-third feed.	44.5	53.4	54.6	67.7	74.2	80.3	84.7	82.9	71.7	75.6	79.4	80.4
Maintenance ration plus two-thirds feed	42.5	50.0	51.1	66.7	72.2	80.0	83.7	83.3	70.2	72.4	77.3	77.8
Maintenance ration plus full feed.....	40.5	44.7	51.1	68.2	68.9	65.9	63.4	80.6	67.5	68.7	74.1	79.1
Average of all tests...	43.3	49.4	52.4	68.2	72.2	76.3	79.5	82.8	71.1	74.6	78.3	80.1

As regards the influence of the character of feed consumed, it was found that the digestibility of the dry substance, protein, fat, and carbohydrates, of a ration consisting of clover hay and ground corn may be increased for steers by decreasing the proportion of clover hay. The same constituents of a ration consisting of clover, ground corn, and linseed-oil meal 1:4:1 are more digestible for steers than those of rations consisting, respectively, of clover hay and ground corn 1:1, 1:3, or 1:5.

As regards the influence of the amount of feed consumed, it was found that the dry substance and carbohydrates of a ration consisting of clover hay and ground corn 1:1 were most digestible for steers when the ration was given in amounts just sufficient for maintenance, and gradually became less digestible as the size of the ration was increased above the maintenance requirements. The dry matter and carbohydrates of the remaining rations were also most digestible for steers when the rations were given in amounts just sufficient for maintenance, but in these cases there was practically no difference between the coefficients for the heavier rations. In none of these four rations did the amount of feed consumed significantly influence the digestibility of the protein and fat.

Coefficients of digestibility of some common rations for swine, W. DIETRICH and H. S. GRINDLEY (*Illinois Sta. Bul. 170 (1914), pp. 165-201, fig. 1; abs. pp. 4*).—In two sets of digestion trials, a pair of year-old barrows, a Berkshire and a Yorkshire in the first experiment and two Berkshires in the second, were fed during 6- to 8-day periods on various combinations of feeds and amounts of feeds. The coefficients of digestibility as determined directly by these experiments are shown in the following table:

Average coefficients of digestibility of rations by swine.

Kind of ration.	Weight of ration per day per 100 pounds, live weight.	Percentage digested.					
		Dry substance.	Protein (N. by 6.25).	Fat.	Total carbohydrates.	Nitrogen free extract.	Crude fiber.
	Pounds.	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.
Ground corn alone.....	1.83	87.7	79.3	71.3	90.9	93.6	31.8
Ground corn and middlings (1:1)	1.95	88.6	87.5	82.5	90.7	92.9	54.9
Ground corn and red dog flour (2:1).....	1.83	87.0	83.6	55.0	90.2	.....	.....
Ground corn and tankage (4:1 to 6:1).....	1.48	83.2	68.7	76.4	90.2	92.4	19.0
Ground corn and pork cracklings (8.3:1 to 10.5:1).....	1.09	89.4	84.6	89.6	91.3	.....	.....
Ground corn, tankage, and pork cracklings (9:2.25:1 to 12:2:1).....	1.55	83.4	72.7	85.3	89.5	.....	.....
Ground corn, red dog flour, and pork cracklings (20:10:1).....	1.77	89.0	85.6	68.9	92.5	.....	.....
Ground corn, red dog flour, tankage, and pork cracklings (4:1:1:1 to 10:2.7:2.6:1).....	.67	84.6	78.7	90.0	89.0	.....	.....

It is concluded that "the coefficients of digestibility obtained for a single feed by calculation from the data obtained for a combination of feeds are not reliable, especially when the single feed has been fed in comparatively small quantities. By this method of calculation all of the difference between the values for the single feed and the corresponding values for the combined feeds is credited to the single feed, whereas it is probable that in the combined ration each feed exerts an influence upon the digestibility of the other."

As regards the influence of one ration upon another, "the results of these experiments indicate that the coefficients of digestibility of one feed or ration

may be increased or decreased by the addition of another feed or ration. For example, the addition of pork cracklings to rations of ground corn alone, ground corn and tankage, and ground corn and red dog flour, clearly increases the digestibility of the dry substance, the crude protein, and the crude fat of the basal rations. On the other hand, it seems probable that the addition of tankage to a ration consisting of ground corn alone decreases the digestibility of the dry substance and the crude protein in the basal ration."

As regards the influence of quantity of ration, "there is a significant increase in the coefficients of digestibility of the dry substance, the crude protein, and the total carbohydrates of a ration consisting of ground corn, red dog flour, tankage, and pork cracklings, when there is a reduction of 26 per cent in the dry substance consumed. On the other hand, there are no significant differences in the coefficients of digestibility for the nutrients of a ration consisting approximately of 10 parts of ground corn and 1 part of pork cracklings when fed as a full-feed allowance and in amounts equal to two-thirds of a full-feed ration."

A study of the development of growing pigs with special reference to the influence of the quantity of protein consumed, A. D. EMMETT, H. S. GRINDLEY, W. E. JOSEPH, and R. H. WILLIAMS (*Illinois Sta. Bul. 168 (1914), pp. 85-135, figs. 9; abs., pp. 4*).—The object of the investigations of which this bulletin is a partial report was to determine the influence of different quantities of protein upon the nutrition of young growing pigs when the rations were supplemented with an ample amount of calcium phosphate.

Three lots of four 51-lb. Berkshire pigs were fed during a 174-day period a ration of ground corn, blood meal, and calcium phosphate, all the pigs receiving the same amount of corn protein per 100 lbs. live weight, lot 1 receiving a low protein ration (0.32 lb. of digestible protein per day per 100 lbs. live weight), lot 2 a medium protein ration (0.7 lb. digestible protein), lot 3 a high protein ration (0.94 lb. digestible protein), the blood meal allowance being 50, 80, and 86 per cent, respectively, of the total protein received, and the lots receiving 3.79, 4.28, and 4.49 therms of metabolizable energy, and 11.09, 9.65, and 8.73 gm. of phosphorus per 100 lbs. live weight per day. The pigs were fed under similar conditions and each pig separately.

A slaughter test was made of two control pigs at the beginning of the experiment and of pigs of each of the three lots. At the close it was noted that the pigs of the low-protein lot were unthrifty and underfed and that three had died. The number of leucocytes in the blood of the remaining pig from lot 1 was possibly somewhat greater than those of the other lots; the kidneys of the animal were distinctly affected with chronic parenchymatous nephritis, and were smaller in length and width than those of the pigs of the other lots, and the liver was abnormal. The dressed carcass was shorter in length, had less fat on the sides, brisket, and flanks, the fat and lean were darker in color, the fat softer and the marrow lighter in color, and while the amount of fat was less the amounts of lean were practically equal. The weights of the intestinal and composite fats were higher, and the weights of the leaf fat, blood, stomach, kidneys, offal, and miscellaneous parts lower than the average for the other lots.

The fasted live weights, the net live weights, and the weight of the various cuts varied directly with the live weights of the animals when slaughtered. In the weights of the skeleton, the respiratory organs, the small and large intestines, and the organs of the central nervous system, the corresponding values for the three lots were similar. The pig on the low-protein ration had the highest percentage of leaf fat, the lightest liver, and the heaviest skeleton.

In none of these values were there any significant differences between lots 2 and 3. There was some indication that the weight of the heart varied inversely as the amounts of protein consumed.

The weights of the bones varied practically directly with the live weights of the animals. There was little difference in the lengths and diameters. The thickness of the walls of the leg bones and the marrow spaces were in proportion to the protein fed, the low-protein fed pig having the thinnest wall and the largest marrow. The breaking strengths and the moduli of rupture of the bones of the pig of lot 1 were lower than those of the other lots, while the average value for the section moduli, a measure of the distribution of the bone material, indicated that the structure of the bones was not affected by the amount of protein consumed.

It is concluded from these observations that the feed allowance given lot 1 was not sufficient for the normal nutrition of young growing pigs, probably because the ration either did not contain enough of the right kind of protein or did not yield enough energy. The allowance given lot 2 was sufficient, and the larger protein allowance given lot 3 exerted but little apparent influence.

A study of the ash content of growing pigs with special reference to the influence of the quantity of protein consumed, R. H. WILLIAMS and A. D. EMMETT (*Illinois Sta. Bul.* 169 (1914), pp. 139-159; *abs.*, pp. 3).—Continuing the work reported above by a study of the ash content of these pigs, it is concluded that "variations in the amounts of digestible protein consumed from 0.32 to 0.94 lb. per 100 lbs. live weight per day, do not influence significantly the percentages or distribution of the total or water-soluble ash in the bodies or the parts of the bodies of growing pigs. The total ash in the bodies of pigs 40 to 43 weeks old is distributed among the parts as follows: Somewhat more than four-fifths in the skeleton, about one-ninth in the boneless meat of the carcass, and about one-sixteenth in the offal, blood, and the composite of the jowl, leaf, and intestinal fats combined. Of the water-soluble ash, somewhat less than three-fifths is to be found in the boneless meat of the carcass, about one-third in the offal, the blood, and the composite of the jowl, leaf, and intestinal fats, and about one-twelfth in the skeleton.

"The percentages of total ash in the bodies and the parts of the bodies of pigs 40 to 43 weeks of age are significantly different from the corresponding percentages for pigs 18 weeks of age. The offal and carcasses of the younger animals contain practically twice as much as those of the older pigs, while the skeletons contain only about three-fourths as much. The rations of the total ash in the boneless meat to the total ash in the skeletons of the older animals are also distinctly different from the corresponding rations for the younger animals. As the pigs become older the ratio of total ash in the boneless meat of the carcass to total ash in the skeleton decreases, while the ratio of total ash in the entire body to the total ash in the skeleton remains approximately constant."

A bibliography is appended.

A study of the phosphorus content of growing pigs with special reference to the influence of the quantity of protein consumed, R. H. WILLIAMS and A. D. EMMETT (*Illinois Sta. Bul.* 171 (1914), pp. 205-230, *figs.* 5; *abs.*, pp. 4).—Continuing the work reported above by a study of the phosphorus content of the pigs, it is concluded that "variations in the amounts of digestible protein consumed, from 0.32 lb. to 0.94 lb. per 100 lbs. live weight per day, do not influence significantly the percentages or distribution of the total, the water-soluble, or the water-soluble inorganic phosphorus in the bodies or the parts of the bodies of growing pigs. The total phosphorus in the bodies of pigs 40 to 43 weeks of age is distributed among the parts as follows: About four-fifths in the skeleton,

one-ninth in the boneless meat of the carcass, one-twentieth in the offal (including blood), and one-four-hundredth in the composite of the jowl, leaf, and intestinal fats. The water-soluble phosphorus makes up about seven-tenths of the total phosphorus in the boneless meat of the carcass, two-thirds of that in the offal, one-half of that in the composite of the jowl, leaf, and intestinal fats, one-ninth of that in the entire body, and one-twentieth of that in the skeleton. About nine-tenths of the water-soluble phosphorus in the boneless meat of the carcass, seven-tenths of that in the entire body, seven-eighths of that in the skeleton, and three-fourths of that in the offal is in the inorganic form.

"During the period of growth from the time pigs are 18 weeks old (51 lbs. live weight) until they are 40 to 43 weeks old (195 lbs. live weight), the percentage of total phosphorus in the skeleton is increased about one-half, and that in the entire body is increased about three-twentieths. In the boneless meat of the carcass and in the composite of the jowl, leaf, and intestinal fats, the percentage of total phosphorus is decreased about one-half. The percentage increase of the phosphorus is 458 per cent in the skeleton, 330 per cent in the entire body, and 107 per cent in the boneless meat. The phosphorus stored in the body during growth is equal to 23 per cent of the total phosphorus consumed during the same period of time."

A bibliography is appended.

A study of the forms of nitrogen in growing pigs, with special reference to the influence of the quantity of protein consumed, W. E. JOSEPH (*Illinois Sta. Bul.* 173 (1914), pp. 289-317, fig. 1; abs. pp. 3).—Continuing the work reported above, a study was made of the average distribution of forms of nitrogen in the bodies of five pigs 40 to 43 weeks old. In the boneless meat of the dressed carcass the percentages of total nitrogen, soluble nitrogen, protein nitrogen, and nonprotein nitrogen, were as follows: 2.018, 0.473, 1.863, and 0.156, respectively; in the bone and marrow 3.676, 0.383, 3.495, and 0.181, respectively; and in the entire body 2.361, 0.562, 2.181, and 0.18, respectively. In the blood there was 3.036 total nitrogen, 2.935 protein nitrogen, and 0.101 nonprotein nitrogen.

It is concluded that "variations of from 0.32 to 0.94 lb. per 100 lbs. live weight per day in the amounts of protein consumed by growing pigs do not seem to affect the nature of the nitrogenous material produced during growth. While it is possible that, within narrow limits, slight variations may result from differences in the amounts of protein consumed, it seems much more probable that variations in the composition of the nitrogenous constituents are due to causes inherent in the animal itself which normally are independent of the character of the feed consumed. Apparently, under given experimental conditions, the only way in which the influence of these individual variations may be reduced is in selecting the experimental animals carefully and including a considerable number of animals in each group. When the supply of protein is deficient either quantitatively or qualitatively, it seems that only the amount of the body protein is affected, while the character of the proteins formed in the various tissues remains unchanged."

A study in annual egg production based on the records of a flock of seven-year-old hens and their progeny, E. D. BALL, G. TURPIN, and B. ALDER (*Utah Sta. Bul.* 135 (1914), pp. 3-44, figs. 3).—In this study, based upon nearly 1,500 records of six flocks of single-comb White Leghorn hens, ranging in age from seven years to one year and of common ancestry, practically unselected as to egg production but severely selected for vigor, the following results were obtained:

The average productive life of this strain of fowls appears at the present time to be about four years. The average first year production of all flocks

was 124 eggs. The average second year production was exactly the same as the first, while the average of the third year was only one dozen less.

The normal variation in first year flock averages of this strain of fowls is apparently between 100 and 160 eggs, the second year between 105 and 140, and the third year between 100 and 130. After that the average for all ages has been very close to 90 eggs per year. There appears to be a fairly definite potential laying capacity for a flock of this strain of fowls which finds expression in the first three years. The total production of a flock for the first three years appears to be the same regardless of whether the first year record was extremely high, extremely low, or medium in amount. Apparently nearly all of the longer-lived hens of a flock will lay over 500 eggs; the majority of them will lay over 600 or 700, while some individual records running from 800 up to nearly 1,000 eggs may be expected.

Considering only hens that have made three or more years' records, the uniformity of the three-year averages is still more striking. The difference between the highest and lowest records in a flock has averaged 170 for the first year and 182 for the second year. In flocks making low first year records the second and third year records were high and there was little difference in production in these two years between the high layers and the low layers of the first year. In the flocks making high first year records the second and third years' records were low but the higher layers of the first year continued to be the highest producers of these flocks for these years. The 10 hens making the highest second year's record gave a higher three-year total than the 10 making the highest first-year record. More hens have made their highest year's record after the first year than during that year. Three hens made their highest record the fifth year. Nearly all the hens in these flocks whose total production has been extremely high have made low or only medium first-year records.

From these studies it appears that the three-year average is the most reliable index of the value of a given individual.

DAIRY FARMING—DAIRYING.

The comparative efficiency for milk production of the nitrogen of alfalfa hay and the corn grain.—Preliminary observations on the effect of diuresis on milk secretion, E. B. HART and G. C. HUMPHREY (*Jour. Biol. Chem.*, 19 (1914), No. 1, pp. 127-140, figs. 3).—In two experiments comparing the efficiency for milk production of the nitrogen of alfalfa hay and of the corn grain, Holstein cows in full milk were fed by the reversal method for periods of four weeks the two rations, (1) corn-meal, gluten feed, and corn stover, and (2) alfalfa hay and cornstarch, in such quantities that the total consumption of air-dried matter, total therms, total nitrogen, and nutritive ratios were approximately alike in the two rations. In the first experiment the digestive nitrogen in the two rations was closely comparable while in the second experiment the nitrogen intake was kept at a higher level in the alfalfa ration. Records were taken of the nitrogen balance, milk nitrogen, and urine output.

"The data indicate that on the plane of intake used the nitrogen of alfalfa hay is as effective for milk protein building as that of the corn kernel. The acid amid nitrogen of alfalfa is very low in amount, constituting about 1 per cent of the total nitrogen, while the amino acid nitrogen makes about 10 per cent of the total nitrogen. It is well established that amino nitrogen has nutritive value and that of alfalfa hay is probably not an exception. Our experiments give no indication of the value of the acid amid nitrogen. The real nutritive value of the nitrogen of roughages should rest upon the nature of the total amino acid content derived from more complex proteins and preexisting free amino

acids rather than upon the proportion of 'amid' nitrogen as found by the Stutzer method.

"Alfalfa hay has specific diuretic properties and its ingestion was generally followed by a marked rise in the output of urine. This rise in renal activity caused a depression in the milk flow which again rose in volume as the alfalfa hay was withdrawn from the ration. The diuretic stimulus caused in some cases a shrinkage in volume of from 5 to 6 lbs. on a flow of 25 lbs. daily. It is possible that this diuretic effect is due to salts contained in the hay, yet the possibility of the presence of specific substances of organic nature is not excluded."

Studies on the bacterial flora of various prepared feedstuffs in fresh and fermented condition, with especial reference to their influence on milk, A. WIGGER (*Centbl. Bakt. [etc.], 2. Abt., 41 (1914), No. 1-8, pp. 1-232*).—After a consideration of the types and number of bacterial flora found in bran, peanut meal, and sesame meal, the author reports experiments testing the influence of the inoculation of 0.01 gm. of these feeds into 100 cc. of milk.

In both the fresh and fermented stage, this inoculation resulted in early perceptible microscopic changes in both ordinary consumers' milk and in sterilized milk. At 37° C. there occurred heavy gas development, while at 22° and at 12° the change was not so perceptible. In sterilized milk at 12° the bacteria of the fluorescens group, except the lactic acid bacteria, appeared in large numbers. The results of these tests agree with those of other investigators that the *Bacterium g ntheri* develops better in fresh consumers' milk than in sterilized milk. In sterilized milk the inoculation with fresh and fermented feeds results in the development in general of a richer quality of microflora than under similar conditions in ordinary milk.

Studies on two and three milkings per day of milch cows, H. ISAACHSEN, A. LALIM, and J. GRANDE (*Ber. Foringsfors ks Stat. Norges Landbruksh iskole, 1913, pp. 11-33; abs. in Zentbl. Agr. Chem., 42 (1913), No. 10, pp. 710, 711*).—These tests indicated that for cows giving from 10 to 15 kg. (22 to 33 lbs.) of milk per day, from 0.7 to 1 kg. more milk could be secured by three milkings per day than by two milkings. There was no influence upon the fat percentage of the milk.

Experiments with the Hegelund milk method and the ordinary good milking, H. ISAACHSEN and J. GRANDE (*Ber. Foringsfors ks Stat. Norges Landbruksh iskole, 1913, pp. 34-47; abs. in Zentbl. Agr. Chem., 42 (1913), No. 10, pp. 711, 712*).—Tests of the Hegelund method of milking, consisting in a manipulation of the udder preliminary to milking, indicated but little advantage of this method over the ordinary good milking methods.

Studies on the fat content of cows' milk in various stages of milking, H. ISAACHSEN (*Ber. Foringsfors ks Stat. Norges Landbruksh iskole, 1913, pp. 48-69; abs. in Zentbl. Agr. Chem., 42 (1913), No. 10, pp. 712-714*).—It was found that the percentage of fat of milk may vary from 1 per cent at the beginning of the milking to 10 per cent at the close; that when milk is taken from one-half the udder by the calf the fat content of the milk of the other half is similar to that of the entire udder; that the content of dry matter is fairly constant from day to day except when there are large changes in fat content; and that the content of fat-free dry matter is as large in the first milking as in the last portion.

The limits of error in milking tests at intervals of one, two, and four weeks, B. MARTINY (*Arb. Deut. Landw. Gesell., No. 254 (1913), pp. 27-32*).—During a four-week trial of a milking machine with 20 cows the total yields obtained were compared with those obtained from weekly tests. Sampling once in four weeks gave an average difference in milk yield of ± 10.7 per cent, of fat ± 16.4 ; and a maximum difference in milk yield of ± 17.1 , and of fat ± 27.05

per cent. From this it is seen that large variations occur during a four-week period, thus lowering the reliability of such a test as compared with one taken weekly.

Review of milk hygiene investigations of the last twelve years, W. RULLMANN (*Centbl. Bakt. [etc.]*, 1. Abt., Orig., 71 (1913), No. 2-3, pp. 165-182).—The author reviews the principal chemical and bacteriological tests of milk and milk products that are of practical use in milk hygiene control.

The hygiene of the transportation of animal-food products by rail, boat, and wagon in the United States, R. M. CHAPIN (*Trans. 15. Internat. Cong. Hyg. and Demogr. Washington*, 5 (1912), Sect. 7, pp. 121-128).—An account of the most approved methods of refrigeration and transportation of animal-food products in the United States, and a plea for adequate federal, state, and municipal inspection service.

The supply of milk to Indian cities, H. H. MANN (*Agr. Jour. India*, 9 (1914), No. 2, pp. 160-177).—The author attempts to show the deplorable condition of city milk supply at present in western India, the difficulties in improving it, and the methods which seem to offer the most hopes of success.

The economic problems of milk distribution in their relation to the public health, J. R. WILLIAMS (*Trans. 15. Internat. Cong. Hyg. and Demogr. Washington*, 5 (1912), Sect. 7, pp. 128-140).—The author contends that the economic aspects of milk distribution in our large cities are probably of more importance in their relation to public health than the purely sanitary problems. A study was made of 15 sections of the city of Rochester, N. Y., each containing from 100 to 700 homes, and each section differing more or less from the others in wealth, social standing, or nationality. It was found that the poorer classes use less milk and accordingly buy it in smaller quantities, and that the use of store milk and condensed milk is largely confined to the laboring classes.

Another fact noted was the large number of milkmen going into each district. It is claimed that at the present time half of what the consumer pays for milk is required to maintain this wasteful system of distribution. It is believed that if the milk supply of this city was to be distributed by one agency properly organized and equipped, a saving to consumers of at least \$500,000 yearly could be effected. Likewise the present system of distribution is held responsible for much of the poor milk that is sold.

It is suggested that cities should control their own milk supplies, to the end that the people may have pure, wholesome milk at a minimum cost.

Influence of foot-and-mouth disease on the constitution of milk and butter, F. BORDAS and DE RACZKOWSKI (*Ann. Falsif.*, 7 (1914), No. 68, pp. 271-292).—It was found that the fat and mineral substances, notably the chlorids, of the milk of cows affected with foot-and-mouth disease were materially increased. There was no material modification in the lactose content, and the quantity of organic phosphorus in the milk was comparable with that of the normal healthy cow. The acidity of the milk was not altered. It was noted that the influence on the yield was not marked, the first day there being a slight increase, with a gradual diminution thereafter. Certain of the milks appeared viscous, with occasionally a reddish coloration. The milk may be contagious, pus cells and pathogenic bacteria being present. An inoculation of a guinea pig confirmed its contagious character.

The influence of the disease on the constitution of butter appears to be variable, some butters being altered in constitution, while others are practically normal. All such butters, however, should be considered unmarketable.

The influence of *Bacterium lactis acidii* upon the changes caused in milk by some of the common milk micro-organisms, C. N. BROWN (*Rpt. Mich. Acad. Sci.*, 15 (1913), pp. 71-73).—It is stated that the growth of *B. lactis acidii* in

milk may be either stimulated or retarded by association with other micro-organisms. Stimulation in both rapidity and duration occurs if in the medium are present some acid-destroying or acid-retaining compounds, as insoluble carbonates, casein, etc. A factor which may stimulate the growth of *B. lactis acidi* when growing in association with liquefying organisms is an increased supply of food made available by the proteolytic changes, as for example, the addition of peptone.

The growth of most of the organisms commonly found in milk may be either stimulated or retarded by association with *B. lactis acidi*. "The changes caused in milk by many micro-organisms in pure culture are greatly retarded or prevented if at the beginning an equal number of *B. lactis acidi* is introduced; the organism alone producing its characteristic changes while in the association the changes produced are those characteristic of the lactic alone. If, however, the organism is given a lead before the lactic is introduced, it is able, usually, to make its changes detectable. . . .

"Changes occurring in milk as a result of the associative growth of a lactic with another organism are influenced by the change in reaction, the accumulation of metabolic products of both the organism and the lactic, the temperature of growth, the accessible supply of oxygen, etc. However, the hindrance or encouragement in the production of enzymes offered by the lactic through its metabolic products to other organisms growing in association is a factor that can not be overlooked."

Biorized milk, KLUNKER (*Molk. Ztg. [Hildesheim]*, 28 (1914), Nos. 33, pp. 625, 626; 34, pp. 639, 640).—In investigations made of the Lobeck milk sterilization process at the Institute of Hygiene, University of Jena, it was demonstrated that the apparatus is convenient to handle, the loss of milk is small, and the biorized milk is equal in appearance and flavor to the best raw milk. It is somewhat less easily skimmed than raw milk, although the difference is of little consequence. The original enzymes of the milk are not influenced by the process nor are the proteins altered. Coagulation is less rapid but is not weakened. The germ content is so lowered that the keeping quality of the milk is greatly increased, and the disease-producing germs are destroyed.

Milk sterilization by electricity, J. B. C. KERSHAW (*Engin. Mag.*, 47 (1914), No. 6, pp. 916-919, fig. 1).—Experiments on the effects of a rapidly alternating current at high potential in milk sterilization showed that disease-producing and milk-souring bacteria were practically destroyed in the raw product, there being a reduction in the total number of bacteria of 99.93 per cent. The chemical constitution of the electrically treated milk was unimpaired and the taste was in no way altered. The milk was not only rendered nonpathogenic as regards ordinary bacteria, but in two cases in which the control supply was tuberculous the electrically treated milk was free from tubercle bacilli and regarded as a satisfactory food for infants.

Composition of Roquefort-cheese fat, J. N. CURRIE (*U. S. Dept. Agr., Jour. Agr. Research*, 2 (1914), No. 6, pp. 429-434).—Comparing the composition of the fats of Roquefort cheese and of cow's milk it was found that the Reichert-Meissl number of the cheese fat ranged between 25.64 and 29.62, while that of cow's milk fat was 27.27; the Polenske number between 5.55 and 6.25, that of cow's milk fat 2; soluble acids of 5 gm. of cheese fat expressed in cubic centimeters of tenth-normal acid between 38.8 and 41, cow's milk fat 26; and insoluble acids of cheese fat between 18.01 and 19.2, and cow's milk fat 11.17. The percentage of acids in the fats of Roquefort cheese as determined and of cow's milk as reported by Browne (*E. S. R.*, 11, p. 615) were respectively as follows: Butyric 3.48 and 5.45, caproic 4.73 and 2.09, caprylic 0.58 and 0.49, capric 3.8

and 0.32, lauric 5.84 and 2.57, myristic 11.36 and 9.89, palmitic 28.53 and 38.61, stearic 1.91 and 1.83, oleic 38.1 and 32.5, and dioxystearic 0 and 1.

It is concluded that "the differences between the fat of typical imported Roquefort cheese and the fat of cow's milk are not great enough to warrant the exclusive use of sheep's milk in the manufacture of this type of cheese. However, it is evident that an imported cheese, made wholly or chiefly from sheep's milk, will have more of the peppery taste than a cheese of the same ripeness made from cow's milk."

VETERINARY MEDICINE.

The anatomy of the domestic animals, S. Sisson (*Philadelphia and London, 1914, 2. ed. rev., pp. 930, figs. 725*).—This work supersedes the author's Text-book of Veterinary Anatomy, previously noted (*E. S. R., 24, p. 81*). More than 300 new and original figures have been included, many changes have been made in the nomenclature, and most of the synonyms have been dropped or relegated to footnotes.

Chemical pathology, H. G. Wells (*Philadelphia and London, 1914, 2. ed. rev., pp. 616*).—The contents of the second edition of this well-known work, which has been thoroughly revised, are as follows: The chemistry and physics of the cell; enzymes; the chemistry of bacteria and their products; chemistry of the animal parasites; phytotoxins and zootoxins; chemistry of the immunity reactions; chemical means of defense against nonprotein poisons; inflammation; disturbances of circulation and diseases of the blood; edema; retrogressive changes (necrosis, gangrene, rigor mortis, parenchymatous degeneration); retrogressive processes—fatty, amyloid, hyalin, colloid, and glycogenic infiltration and degeneration; calcification, concretions, and incrustations; pathological pigmentation; the chemistry of tumors; pathological conditions due to, or associated with, abnormalities in metabolism, including autointoxication; gastrointestinal autointoxication and related metabolic disturbances; chemical pathology of the ductless glands; uric acid metabolism and gout; and diabetes.

Handbook of the pathogenic micro-organisms, edited by W. KOLLE and A. VON WASSERMANN (*Handbuch der pathogenen Mikroorganismen. Jena, 1913, 2. rev. ed., vol. 2, pts. 1, pp. 792, figs. 10; 2, pp. 793–1561, pl. 1, figs. 11*).—This is the second volume of the second edition of this well-known work. The first part deals with Methods for Immunization, including the Preparation of Antigens, by M. Ficker (pp. 1–192); Methods for Producing Antibodies, by M. Ficker (pp. 193–241); Antitoxic Sera, by A. von Wassermann and M. Wassermann (pp. 242–295); Bactericidal Sera, by E. Friedberger (pp. 296–400); Bacterial Tropins and Opsonins, by F. Neufeld (pp. 401–482); Agglutination, by R. Paltauf (pp. 483–654); Phagocytosis and Its Experimental Principles, by E. Metschnikoff (pp. 655–731); and Precipitins, by R. Kraus (pp. 732–792).

The second part considers Hemolysins of the Blood Serums (Cytotoxic Sera), by H. Sachs (pp. 793–946); Allergy and Anaphylaxis, by R. Doerr (pp. 947–1154); The Heredity Problem in Immunity, by J. Morgenroth and H. Braun (pp. 1155–1174); The Valuation of Protective and Curative Sera, by R. Otto and K. E. Boehneke (pp. 1175–1240); Colloids and Lipoids in Immunity, by K. Landsteiner (pp. 1241–1300); Leucocyte Ferments and Antiferments, by G. Jochmann (pp. 1301–1327); Hematoxins and Antihematoxins of Bacteria, by E. Pribram (pp. 1328–1361); Bacterial Nucleoproteins, by A. Lustig (pp. 1362–1380); Animal Poisons and Their Antitoxic Serum Therapy, by A. Calmette (pp. 1381–1406); Animal Toxins and Immunity Research, by H. Sachs (pp. 1407–1452); Ricin, Abrin, and Croton, and Their Antitoxins, by M. Jacoby (pp.

1453-1468); Hay Fever Toxins and Hay Fever Serum, by C. Prausnitz (pp. 1469-1498); and Poisons Producing Fatigue, by W. Weichardt (pp. 1499-1527).

Animal parasites and parasitic diseases, B. F. KAUPP (*Chicago, 1914, 3. ed., rev., pp. XVI+238, pls. 15, figs. 81*).—A revised and enlarged edition of this work (E. S. R., 22, p. 791).

Veterinary hygiene, M. KLIMMER (*Veterinärhygiene. Berlin, 1914, 2. ed. rev. and enl., pp. XII+509, figs. 207*).—A second revised and enlarged edition of this work (E. S. R., 20, p. 81).

Text-book of general therapeutics for veterinarians, E. FRÖHNER, trans. by L. A. KLEIN (*Philadelphia and London, 1914, pp. XII+301*).—This is an English translation from the fourth revised German edition.

The subject is taken up under the headings of the history of therapeutics; general therapeutics of diseases of the organs of digestion and circulation; of fever; of diseases of the nervous system, the respiratory apparatus, the urinary organs, and the genital organs; of the glands (diaphoretics and sialagogues); of diseases of metabolism; of diseases of the eye and of the skin and mucous membranes; drugs that kill parasites (antiparasitics); disinfectants and antiseptics; antidotes; vaccination, immunization, and inoculation; water as a remedy (hydrotherapy); massage; electricity as a remedy (electrotherapy); bleeding; general therapeutics of the organs of locomotion (muscles, tendons, nerves, articulations, bones); indifferent remedies (mechanicals); and air as a remedy.

C. Stephan's pharmacognostic tables, E. STARKE (*C. Stephan's Pharmacognostische Tabelle. Dresden, 1913, 4. enl. ed., pp. XXIV+199*).—This edition deals with 493 substances used as drugs. In each table the name of the drug, its habitat, the part of the plant or animal used, and its usual adulterant (or drug which may be confused with it) are given.

Some notes on bacterin therapy, F. M. SCHOFIELD (*Amer. Jour. Vet. Med., 9 (1914), No. 2, pp. 87-91*).—This discusses in a general way the functions of bacterins in chronic infections and the possibilities and limitations of bacterin therapy.

The problem of protein anaphylaxis with especial reference to the practical antigen diagnosis pro foro, H. PFEIFFER (*Das Problem der Eiweissanaphylaxie mit besonderer Berücksichtigung der praktischen Antigendiagnose pro foro. Festschrift der k. k. Karl-Franzens-Universität in Graz für das Schuljahr 1909-10, pp. 231, figs. 7*).—The contents of this book deal with the history of anaphylaxis, sensitization, and preanaphylactic phenomena, reinjection, active, anti-, and passive anaphylaxis and the methods of measuring the anaphylactic immune body, the significance of anaphylaxis for the practical differentiation of proteins, test tube experiments, experimental examples, and the more important literature pertaining to anaphylaxis.

The antigenic properties of globin caseinate, F. P. GAY and T. B. ROBERTSON (*Jour. Expt. Med., 17 (1913), No. 5, pp. 535-541*).—"This study of globin and its compound with casein (globin caseinate) shows that globin fails to produce fixation antibodies in rabbits after repeated injections, thus agreeing with our own work and with that of others with similar histone bodies which are primarily toxic. When globin is combined with casein, however, it gives rise to antibodies that react not only with globin caseinate and casein but also with globin. The antibodies in antiglobin casein serum are apparently separate, one for globin and one for casein. In other words, the change in globin undergone on combination with casein has apparently rendered it antigenic.

"We did not succeed in demonstrating the genesis of this new antigenic property by anaphylaxis experiments.

"A further investigation of similar and more complex combined proteins is indicated and gives promise of more light on the nature of biological specificity."

Negative results with the ninhydrin reaction as a test for amino acids in the serum of nephritics and others, R. M. PEARCE (*Jour. Amer. Med. Assoc.*, 61 (1913), No. 16, pp. 1456, 1457).—Negative results were obtained with the triketohydrindene hydrate reaction (E. S. R., 26, p. 804) with a total of 47 sera obtained chiefly from nephritics and pregnant subjects. "The first group included acute and chronic nephritis with and without edema, uremia, or high blood pressure; the second, normal pregnancy, eclampsia, and vomiting of pregnancy." In every case where coagulable protein was removed by Folin's method the test with the filtrate was negative.

Biology of the colostrum bodies, E. THOMAS (*Ztschr. Kinderheilk., Orig.*, 8 (1913), No. 4, pp. 291–297, pl. 1).—The polymorphonuclear and mononuclear colostrum bodies, amongst them the epithelial-like granular bodies (*corps granuleux*) show a marked phagocytic power toward various pathogenic organisms. The epithelial nature of these bodies is contradicted. The mononuclears and polymorphonuclears show almost the same phagocytic properties and the former are much more phagocytic than the mononuclears of the blood. The bacteria used in the tests were staphylococci and tubercle and colon bacilli.

Influence of sodium fluorid on the animal body, F. SCHWYZER (*Biochem. Ztschr.*, 60 (1914), No. 1, pp. 32–42; *abs. in Jour. Amer. Med. Assoc.*, 63 (1914), No. 4, pp. 323, 324).—Experiments with rabbits, here reported, show that sodium fluorid when administered steadily even in small doses (1 mg. per day or less per kilogram of body weight) causes a loss of lime, chlorin, and fat from the bones. Thus fluorin should not be used for preserving mashes for live stock or for similar purposes.

Investigations on cotton-seed meal with reference to its toxic action, F. FREEMANN (*Untersuchungen über Baumwollsaamenmehl mit Berücksichtigung seiner toxischen Wirkung. Inaug. Diss., Univ. Bern, 1909, pp. 43*).—The symptoms of poisoning which result from feeding cotton-seed meal are said to be due to ptomaines which have a neurin- or muscarin-like action. The unsaturated fatty acids present in the fat extracted from the meal probably have some relation to the sum total of the toxic action. The ptomaine substances are probably formed from the nitrogen-containing components of the lecithin in the meal. Attempts to obtain the coloring matter present in the ether extract in sufficient amounts for examination were unsuccessful.

Chlor-xylenol-sapocresol (Sagrotan), a new disinfectant, M. SCHOTTELIUS (*Arch. Hyg.*, 82 (1914), No. 2, pp. 76–96; *abs. in Rev. Bact.*, 4 (1914), No. 2, p. 34).—The new disinfectant known commercially as "Sagrotan" is said to represent a distinct improvement in disinfecting value over lysol and other cresol compounds, its germicidal activity being somewhat remarkable. Sporing cultures of anthrax bacilli obtained from different laboratories were destroyed within 24 hours' exposure by a 2 per cent solution of the disinfectant, whereas some of the strains survived after the cultures had been exposed to a 5 per cent solution of phenol for 28 days. Satisfactory results were obtained in other experiments in which material infected with tubercle bacilli, typhoid bacilli, streptococci, and staphylococci was exposed to its action. Feeding experiments on dogs have shown that Sagrotan is less toxic than other cresol compounds.

The bacteriological standardization of disinfectants, H. C. HAMILTON and T. OHNO (*Amer. Jour. Pub. Health*, 4 (1914), No. 6, pp. 486–497, pls. 2).—The authors present data which point to a marked variation in the results of germicidal assays by the Hygienic Laboratory method.^a Suggestions are made as to means of obtaining uniform results in the standardization of disinfectants.

^a Pub. Health and Mar. Hosp. Serv. U. S., Hyg. Lab. Bul. 82 (1912), pp. 74.

Some notes on the systematic dipping of stock, C. R. EDMONDS and L. E. W. BEVAN (*Rhodesia Agr. Jour.*, 11 (1914), No. 7, pp. 988-1003, pl. 1).—A general discussion of the subject, including notes on the biology and a colored diagram showing the stages in the life cycle of the blue, brown, and red-legged ticks.

Report of the civil veterinary department, Assam, for the year 1913-14, W. HARRIS (*Rpt. Civ. Vet. Dept. Assam, 1913-14*, pp. 2+25).—This report includes accounts of the occurrence and treatment of diseases of animals, preventive inoculations, breeding operations, etc.

Collected papers from the research laboratory, Parke, Davis & Co., Detroit, Mich. (*Collected Papers Research Lab. Parke, Davis & Co., Reprints*, 1 (1913), pp. V+287, figs. 35).—This deals with results of investigations conducted chiefly in the laboratory of the institution named above. The material contained therein which is of interest to veterinarians and agriculturists has been reported from the current literature.

The influence of low temperatures on the anthrax bacillus, K. POPPE (*Ztschr. Fleisch u. Milchhyg.*, 24 (1914), No. 21, pp. 485-489, fig. 1).—The author's investigations show that the virulence and reproductive capacity of the anthrax bacillus in meat and in cultures are not affected by exposure to an average temperature of -15° C. (5° F.) for two weeks.

Bursati, J. D. E. HOLMES (*Mem. Dept. Agr. India, Vet. Ser.*, 2 (1914), No. 5, pp. 119-153, pls. 5).—A considerable amount of confusion exists in literature regarding the identity of bursati in India with leeches in America, swamp cancer in Australia, and other affections described as summer sore, granular dermatitis, and parasitic fibromata, etc., and held on the observations of several authors to be connected with the presence of nematode embryos. Bursati varies in most clinical aspects from these affections.

"There is not sufficient evidence to prove that nematode embryos are present in bursati lesions or that the bursati sores or tumors are caused by such embryos. There is a similarity in several clinical aspects between leeches and bursati. The presence of a fungus in leeches has been recorded by several observers and described as causal agent. The spores and mycelia of a somewhat similar fungus are frequently to be found in the kunkur and tumors of bursati. The presence of spores and mycelia in the bursati tumors, and the fact that cultures of a fungus of the genus *Sporotrichum* have repeatedly been obtained from bursati tumors and kunkurs and also direct from the blood of horses infected with bursati, affords some evidence that the disease is a mycosis somewhat resembling the sporotrichosis of the horse and mule described by Carougeau [*E. S. R.*, 21, p. 791] in Madagascar."

The present status as to combating glanders by the veterinary police, with the various methods for diagnosis, and with special reference to the mallein eye test, MARIOTH (*Monatsh. Prakt. Tierheilk.*, 24 (1913), Nos. 7-8, pp. 340-373; 9-10, pp. 426-456).—This is a study and digest of the literature pertaining to the various biological methods for diagnosing glanders. The eye test is given the preference.

In regard to immunity in trypanosome diseases, OFFERMANN (*Ztschr. Veterinärk.*, 25 (1913), No. 7, pp. 299-301).—A 2½-year-old mare received an intravaginal injection of 20 drops of mouse blood containing dourine (Böschal-seuche) trypanosomes diluted with 5 cc. of physiological salt solution on September 16, 1910. From 17 to 20 days post injection trypanosomes were noted in the blood of the animal and all mice which were treated with the blood died.

On April 16, 1911, the horse was treated intravenously with 10 drops of rat blood containing trypanosomes and 5 cc. of salt solution, and on January 6, 1912, subcutaneously with 20 drops of the same amount of blood. The animal remained clinically sound. Parasites, however, persisted in the blood and from

the beginning the temperature was intermittent and at times rose to 41° C. and over.

The trypanosomes were present during the febrile period only and could only be noted by the mouse test. During the following summer months the animal gained in weight and the mouse test showed negative. In November, 1912, i. e., 6 months after the normal period, a sudden rise in temperature up to 40° was noted, and in the following 6 weeks temperature rises of 39.7, 39.4, and 39.1° were seen. The blood from the horse at the febrile period showed positive with the mouse test. The relapse might possibly be due as a result of drawing large amounts of blood, i. e., 6 to 9 liters per week from this animal. The agglutination and complement fixation tests were positive from August, 1911, up to the time of reporting.

Precautions must be taken when immunizing against this disease with trypanosomes.

Abortion and sterility in cattle, W. L. WILLIAMS (*Rpt. N. Y. State Vet. Col., 1911-12, pp. 79-130, pls. 11, figs. 3*).—Substantially noted from another source (E. S. R., 31, p. 779).

The curative treatment of hemorrhagic septicemia in cattle by the administration of iodine, and other notes on chemoherapy in rinderpest and hemorrhagic septicemia, J. D. E. HOLMES (*Mem. Dept. Agr. India, Vet. Ser., 2 (1914), No. 3, pp. 81-104; abs. in Jour. Compar. Path. and Ther., 27 (1914), No. 3, pp. 277, 278*).—A more detailed account of the use of iodine and permanganate of potash in hemorrhagic septicemia than that previously noted (E. S. R., 31, p. 780).

With the exception of iodine and carbolic acid, which modified the severity of the attack and in some cases led to recovery, none of the antiseptics tested proved of value in the treatment of rinderpest. Out of 14 animals treated with iodine after the appearance of symptoms of the disease, six recovered, and in six cases life was prolonged from two to five days. Out of ten animals treated with carbolic acid, three recovered, one lived for 20, one for 15, one for 14, one for 13, and one for 11 days. It is stated that no method of treatment for rinderpest which can be regarded as of much practical value has as yet been discovered.

Remarks upon the paper by P. H. Hadley, Ruth Bryant, and Marguerite Elkins on capsule formation in bacteria of the septicemia hemorrhagica group, L. GÓZONY (*Centbl. Bakt. [etc.], 1. Abt., Orig., 75 (1914), No. 1, p. 21*).—In replying to the paper previously noted (E. S. R., 31, p. 879) the author states that all specimens were prepared with sterilized ink which did not contain capsulated bacteria. Cultures of *Bacillus avisepticus*, *B. suis*, and *B. cuniculicida* were examined and in every case capsules could easily be demonstrated.

Numerous deaths among cattle caused by *Simulium* bites; information on the pupal stage of these flies, H. MIESSNER (*Deut. Tierärztl. Wchnschr., 22 (1914), No. 18, pp. 281-283; abs. in Jour. Compar. Path. and Ther., 27 (1914), No. 3, pp. 269-271*).—It is stated that a large number of deaths among cattle in the Leine district in Germany were caused during the spring by bites of black flies (*Simulium reptans* or *S. columbacense* and *S. ornatum*). Life history studies are briefly reported.

The hemolymph nodes of the sheep.—Studies on hemolymph nodes, I. A. W. MEYER (*Leland Stanford Jr. Univ. Pubs., Univ. Ser., 1914, pp. 74, pls. 5*).—This paper reports results of studies under the headings of distribution, occurrence, and appearance; lymphatic and vascular relations; the microscopic structure; the cellular content; the question of mixed nodes; the genesis of intermediate forms; classification; and functions.

Experiments on the treatment of surra in camels, H. E. CROSS (*Mem. Dept. Agr. India, Vet. Ser.*, 2 (1914), No. 6, pp. 155-198, pl. 1).—"Once surra has been diagnosed it is not necessary to wait till the trypanosomes again appear in the peripheral circulation before treatment is commenced. The intervals between the paroxysms (i. e., when trypanosomes are present in the peripheral circulation) may extend to several weeks, hence a great deal of time can be saved by commencing treatment at once. . . . No case should be considered as cured unless it has been under observation for a year. Relapses may occur after a long interval has elapsed since treatment finished. All cases of camels treated for surra should, therefore, be kept under careful observation.

"Solutions of soamin above 5 per cent should not be used . . . [as] there is great danger of producing nephritis. Although cures can be obtained without increasing the doses of arsenious acid to the subtoxic dose, as a routine method the doses of arsenious acid should be gradually increased till the subtoxic dose is reached, the principle of the treatment being the sterilization of the tissues. Although the doses of arsenious acid may have been gradually increased to the subtoxic dose, it does not necessarily follow that a cure will result. In the combined method as large doses of arsenious acid can not be given as in the treatment by arsenious acid alone or in the treatment by alternate doses of soamin and arsenious acid. The amount of arsenious acid tolerated by camels varies greatly. In different outbreaks the same percentage of cures will not be obtained, the virulence of the trypanosome varying in different outbreaks.

"Good feeding is essential."

Diseases of swine, K. GLÄSSER (*Die Krankheiten des Schweines. Hanover, 1912, pp. VIII+296, pls. 10, figs. 22*).—This work has especial reference to the infectious, invasive, and intoxicative diseases of the pig. It is recommended for veterinarians and students of veterinary medicine.

Hog cholera and the production and use of hog-cholera serum, D. E. SALMON (*Amer. Vet. Rev.*, 45 (1914), No. 2, pp. 178-195).—A concise critical discussion of some of the early work of Smith, Dorset, and McBryde relative to hog cholera. It also contains observations in regard to the production of antihog-cholera serum (with reference to potency, contamination, and mixing virulent blood from different sources) and methods of using it (development of abscesses in vaccinated hogs, serum-alone method, and serum-simultaneous method).

Hog cholera and its control, R. GRAHAM and E. W. MUMMA (*Kentucky Sta. Bul.* 182 (1914), pp. 167-251, figs. 25).—Following the introduction to this bulletin (pp. 169-175) in which J. H. Kastle presents a brief review of hog cholera serum work at the station since 1910, the authors give a general account of hog cholera and means for its control, particularly as relates to the use of antihog-cholera serum. Of 102,087 hogs vaccinated in 2,307 herds during the years 1911, 1912, 1913, and to July 1, 1914, 86,647 were reported upon, of which 90.59 per cent lived.

The regulations of the state live stock sanitary board are appended.

About the practical value of serum protective vaccination against hog cholera, M. ZINGLE (*Berlin. Tierärztl. Wchnschr.*, 30 (1914), No. 7, pp. 119-121).—This describes an outbreak of acute hog cholera which occurred amongst young and old pigs and in which the value of antihog-cholera serum from highly immunized animals was demonstrated. In most cases when the animals were markedly affected with the disease passive immunization did no good.

A contribution to the shoat typhoid question, H. WEIDLICH (*Berlin. Tierärztl. Wchnschr.*, 30 (1914), Nos. 5, pp. 73-76; 6, pp. 89-91, fig. 1).—In view of the controversies which have arisen as to whether *Bacillus voldagsen* has any relation to hog cholera (*E. S. R.*, 24, p. 390; 27, p. 888; 28, p. 183), a biological

study of the Voldagsen bacillus was made in comparison with *B. coli*, *B. typhosus*, *B. paratyphosus* B, Gärtner's bacillus, and *B. suispestifer*.

The results show that *B. voldagsen* has several characteristics in common with *B. typhosus*, but that it can be easily distinguished from the paratyphoid B bacillus and *B. suispestifer*. *B. voldagsen*, for instance, like the typhoid bacillus gives no changes on neutral red (Oldekop) agar, while all the remaining organisms reduce it. It furthermore produces no changes in Hetsch's solution, causes a permanent reddening of litmus milk and a medium turbidity in bouillon, and behaves like *B. typhosus* in the Löffler-green solutions. Some Voldagsen strains produced small amounts of indol while others did not.

The infection test with *B. voldagsen* showed that the bacteria caused a disease resembling virus hog cholera and which heretofore has been considered clinically and pathoanatomically as a form of that disease. It is pointed out that further experiments are necessary to determine whether virulent pestifer strains produce an easily transferable disease in shoats such as is caused by *B. voldagsen*. The disease caused by the filterable virus can be easily distinguished, from the macroscopical-pathological findings in the intestinal tract, from that incited by *B. voldagsen*.

In regard to the causes of meat poisoning.—Paratyphoid B bacilli, Voldagsen type; as a cause of meat poisoning in man, G. BERNHARDT (*Ztschr. Hyg. u. Infektionskrank.*, 73 (1912), No. 1, pp. 64-78; *abs. in Berlin. Tierärztl. Wchnschr.*, 30 (1914), No. 4, p. 65).—In the organs of a woman dying as a result of meat poisoning *Bacillus voldagsen* and *B. typhi suis* (Glässer) were found. Remarkable variations in regard to the cultural properties and agglutination were noted. The author on this account recommends the use of polyvalent paratyphoid sera for diagnosis and suggests that special attention be paid in noting atypical meat poisoning bacteria.

Arterial sclerostomatosis in the horse, S. H. BURNETT (*Rpt. N. Y. State Vet. Col., 1911-12*, pp. 70-78, pls. 2).—A report of histopathological studies read at the Indianapolis meeting of the American Veterinary Medical Association in August, 1912.

Experiments with salvarsan in the treatment of canine distemper, C. KRÖCHER (*Ztschr. Hyg. u. Infektionskrank.*, 78 (1914), No. 2, pp. 321-362).—The author finds that salvarsan does not prevent nor cure distemper in dogs.

RURAL ENGINEERING.

Irrigation branch (*Rev. Rpt. Bihar and Orissa [India], Irrig. Branch, 1912-13*, pp. II+139, pls. 4).—In addition to statistical and other data maps are given showing irrigation canals and the areas irrigated.

The water economy of the earth, W. HALBFASS (*Naturw. Wchnschr.*, 29 (1914), No. 38, pp. 593-598).—The author reviews a number of theories and opinions regarding the relative effects on the waters of the earth of precipitation, run-off, evaporation, and condensation, which taken as a whole constitute a cycle of more or less closely related events which are thought to influence profoundly the distribution of terrestrial water between land and sea. He is of the opinion that existing conditions point to the necessity of providing storage dams, reservoirs, and other artificial means for preventing run-off in order that the water economy of the earth may be placed on a more efficient basis.

Tests on plain and reinforced concrete tiles, G. P. DIEKMANN (*Concrete-Cement Age*, 4 (1914), No. 5, pp. 250, 251).—Tile 28 in. in diameter with a wall thickness one-tenth the diameter and consisting of a semiwet mixture of 1 part cement and 3 parts sand were used in the tests. The reinforcing was the dou-

ble wire hoop of No. 7 wire, 0.176 in. in diameter; 2, 3, 4, 5, and 6 double wire hoops being used.

The reinforced tile had a lower breaking strength when tested wet than when dry. Tile reinforced with 2 double wire hoops collapsed like plain tile. Three reinforcing hoops increased the strength 28.4 per cent; 4 hoops, 46.2 per cent; 5 hoops, 88 per cent; and 6 hoops, 102 per cent.

Handy tables for computing the cost of tile drains, J. L. PARSONS (*Humboldt, Iowa* [1914], pp. 20).

Notes upon the water hyacinth, R. T. WARD (*Prof. Mem. Corps Engin. U. S. Army*, 6 (1914), No. 29, pp. 644-648, fig. 1).—Methods of destroying excessive growths of the water hyacinth in waterways and drainage channels are described, the most successful method being that of spraying with a chemical solution.

Earth roads, C. E. MORRISON (*New York*, 1914, pp. V+30; rev. in *Good Roads*, n. ser., 8 (1914), No. 1, p. 26).—“This book, which is a brief treatise on the elementary principles of the construction of earth roads, is intended primarily for the road officials of small towns, road districts, and the like, and for laymen in general. The subject-matter, while dealing with the technic of road building, is presented in nontechnical language. Throughout the book the effort has been to secure conciseness and simplicity and, at the same time, present all the salient features of the subject. The text is divided into sections on general considerations, road location, cost as affected by location, traction, grades, soil conditions, drainage, width of roads, side slopes, earth work, maintenance, dragging, sand-clay roads, and burnt-clay roads. The book is illustrated by drawings showing correct and incorrect cross sections for roads on various kinds of soil, underdrainage systems, ditches, and drains; and by a full-page working drawing for a 2-ft. reenforced-concrete box culvert.”

The use of explosives in agriculture, H. F. MACMILLAN (*Dept. Agr. Ceylon Bul.* 8 (1913), pp. 105-118, pls. 9).—This bulletin records the results of several tests to determine the radial effect of an explosive in definite but varying conditions of soil, and describes recognized methods of procedure in blasting soils, boulders, and stumps, as well as the necessary precaution to be observed.

The radial disturbing effect of a one-cartridge charge was noticable at 3 ft. and distinctly evident at 2 ft., but was not visible at 4-ft. distance in ordinary light soil in dry weather. Very similar results were obtained in a hard gravelly “cabook” soil after heavy rains. In a stiff clayey “cabook” soil the radial effect of a one-cartridge charge was visible at distances of 2, 2½, and 3 ft.

Similar charges were exploded in similar soils and let stand for two months without opening. A hole 2½ ft. deep placed between tea bushes showed no traces of collected water when opened in dry weather but was partly filled with loose earth and plant roots. Holes in the “cabook” and gravelly “cabook” soils showed distinct signs of the collection of moisture, although the surrounding soil was dry. It is concluded that in practical operations of this kind such holes should, after the lapse of a few hours or so, be prodded well through with a crowbar to prevent needless empty spaces; or the holes may be dug up and an application of manure or mulch mixed with the soil.

The results of stump-blasting tests were not particularly successful owing to the formidable nature of the stumps blasted out, but they indicate the possibilities along this line.

The author arrives at the general conclusion that the effects of blasting on soils are analogous to those of manuring and the benefits more lasting. “Though the efficiency of the use of explosives generally leaves little room for doubt, the question of cost will obviously weigh largely with many planters who contemplate adopting it. The initial outlay, however, should be regarded rather in

the nature of capital invested, as if the operation is judiciously and properly carried out the cost will doubtless be recoverable with interest in the form of increased crops." In some cases the cost of operating on a large area may be considerable, but it is not necessarily essential to treat the whole area, as in many cases only the poorest portions need be exploded.

A self-steering farm motor, H. I. WASHBURN (*Sci. Amer.*, 110 (1914), No. 15, p. 313, figs. 2).—An apparatus is illustrated and described which, when attached to a specially made farm motor, controls the steering mechanism.

The testing of lubricating oil for internal combustion motors, G. LUMET (*Compt. Rend. Acad. Sci. [Paris]*, 158 (1914), No. 3, pp. 172-175; *abs. in Rev. Sci. [Paris]*, 52 (1914), I, No. 5, p. 155).—A machine is described for determining the coefficient of friction of lubricating oil, and tests regarding the theory of its use are discussed.

The draft of plows, S. S. GODBOLE (*Poona Agr. Col. Mag.*, 5 (1914), No. 3, pp. 173-176, fig. 1).—The author enumerates the factors influencing the draft of plows and describes the manner in which each operates. Comparative tests of three types of plows with respect to the factors influencing the draft showed that none stood first in every respect.

Relation between electricity and threshing machine fires, A. H. SHOE-MAKER (*Threshermen's Rev.*, 23 (1914), No. 9, pp. 16, 18, 20, fig. 1).—It is claimed that almost all of the unexplained thresher fires originate from the combustion of inflammable dust caused by electrical discharges between certain parts of the machines.

Forms for concrete work, H. H. RICE (*Farm Engin.*, 2 (1914), No. 2, pp. 24, 25, figs. 4).—Forms adapted to farm structures are described and illustrated.

Stables, M. RINGELMANN (*Jour. Agr. Prat.*, n. ser., 27 (1914), Nos. 24, pp. 755, 756, fig. 1; 25, pp. 794-796, figs. 4).—Information is given regarding the proper arrangement of stables for breeding and fattening stock, work animals, and milch cows, with illustrations.

Silos and silage, N. A. NEGLEY (*Alabama Col. Sta. Circ.* 26 (1914), pp. 87-94, figs. 3).—This circular, reporting cooperative work between this Department and the Alabama Station, gives popular information regarding the construction of concrete and stave silos including bills of material.

It is stated that the concrete and stave silos are the two most common types in Alabama. The stave silo is recommended where material for concrete can not be obtained at a reasonable cost and where lumber is cheap. The pit silo is not recommended if it is at all possible to build one of the other types.

It is stated that raw coal tar thinned with gasoline to the consistency of paint should be applied to the inside of the stave and concrete silos, and also to the wall of the pit silo if it is plastered.

The Missouri silo, C. M. LONG (*Missouri Bd. Agr. Mo. Bul.*, 12 (1914), No. 8, pp. 39, figs. 19).—General information regarding the construction of silos is presented in a popular way.

The so-called Missouri silo is particularly recommended as being a cheap and satisfactory type of wooden silo for the renter or less well-to-do farmer. This silo is usually made of flooring put together in sections with wooden hoops. It may be taken down when empty, and it is claimed that it can built for about a dollar per ton capacity.

The Gurler and solid concrete silos are also described as homemade silos.

Proceedings: Conference of farmers institute and short course workers on permanent and sanitary farm improvements (*Chicago, 1913*, pp. 176, figs. 122).—Permanent and sanitary farm improvements using concrete as the main structural material are discussed in these proceedings.

Sanitary engineering and agricultural engineering, P. HANSEN (*Threshermen's Rev.*, 23 (1914), Nos. 5, pp. 7, 8, 23, figs. 2; 6, pp. 44-46; 7, pp. 40-42; 8, pp. 45, 46).—This article deals in a general way with water supply, plumbing, and sewage disposal for rural homes.

Water supply, L. KROPF (*Maschinen Ztg.*, 12 (1914), Nos. 13, pp. 145-149, figs. 3; 14, pp. 160-162, figs. 4).—General information regarding water supply for farmhouses, buildings, garden fountains, etc., under German conditions, and cost data for pumping by gas engine, windmills, and electricity are given.

The farm water supply, H. C. RAMSOWER (*Farm Engin.*, 2 (1914), No. 2, p. 32, figs. 3).—The installation and operation of the hydraulic ram are described and illustrated.

Some notes on water supply in the rural district of Atherstone, H. J. COLEBY (*Surveyor*, 45 (1914), No. 1148, pp. 91, 92; *Sanit. Rec.*, 53 (1914), No. 1260, pp. 82, 83; *abs. in Wasser u. Abwasser*, 8 (1914), No. 7, pp. 463, 464).—The author describes the wells, machinery, and other equipment used for supplying water to a rural district of 18,000 inhabitants and covering an area of 25,000 acres. The fact that one supply obtained from the Carboniferous formation is a failure is mentioned to show the capricious character of this formation from the water-supply standpoint.

A treatise on water supplies, A. FRIEDRICH (*Kulturtechnischer Wasserbau. Berlin, 1914, vol. 2, 3. rev. and enl. ed., pp. XVI+806, pls. 25, figs. 318*).—This represents the second volume, third edition, of a handbook for the use of sanitary, structural, and agricultural engineers. The main subjects covered are water supplies for villages, construction of storage reservoirs, village sewers, and the purification and agricultural utilization of sewage.

A large amount of working data of an engineering nature is given regarding the storage and distribution of water supplies, water and sewage purification, and the judgment of water supplies, and chemical and biological processes are described. Much structural data is given in graphic form and by means of diagrammatic illustrations.

Owing to the extremely variable character of sewage, its agricultural utilization is considered to be closely related to both irrigation and fertilization, so that its proper use will depend on its concentration, the crops grown, and the character of the soil and its need for fertilizers and moisture. In this connection three possible general uses are given, as follows: (1) The use of concentrated sewage as a fertilizer on soil needing little additional moisture, (2) the use of sewage of normal concentration on soil which, next to fertilizers, needs additional moisture, and (3) the use of artificially diluted sewage on soil particularly in need of additional moisture.

Water purification by ozone, G. ERLWEIN (*Fortschr. Naturw. Forsch.*, 10 (1914), pp. 157-202, figs. 32).—The author briefly describes the properties of ozone and the theory of the process of water purification by means of it, describes and illustrates a number of methods and typical installations, and reviews the results of biological examinations of water so treated. He concludes that this process destroys a greater number of bacteria than the sand filtration process, particularly the cholera and typhoid bacteria. The water is not impaired chemically, no bad taste remains, and coloring matter is removed.

The use of chlorin compounds for the purification of drinking water, J. D. RUYs (*Handel. Vlaamsch Natuur en Geneesk. Cong.*, 17 (1913), pp. 492-495).—The author discusses particularly the use of calcium hypochlorite.

The sterilization of drinking water and other fluids by means of ultra-violet light, J. G. SLEESWIJK (*Handel. Vlaamsch Natuur en Geneesk. Cong.*, 17 (1913), pp. 488-491).—The author compares submerged and unsubmerged

mercury vapor quartz lamps and favors the former type. He points out in addition that to use successfully ultraviolet rays for sterilization, the water must first be clear and free from color, and also that the degree of sterilization will depend on the velocity of the water past the lamp and the depth of the layer of contact. He has doubts as to the practical use of ultraviolet light for the sterilization of milk.

Sewage disposal and sludge conversion, J. D. WATSON (*Surveyor*, 45 (1914), No. 1147, pp. 55-59; *Sanit. Rec.*, 53 (1914), Nos. 1259, pp. 64, 65; 1260, pp. 81, 82; 1261, pp. 109, 110; *abs. in Wasser u. Abwasser*, 8 (1914), No. 7, p. 417).—After discussing the sanitary aspects of sewage purification and disposal, the author points out the need for the conversion of fixed nitrogen in sewage sludge for fertilizing purposes. He states that according to Crookes the United Kingdom is discharging into the sea annually fixed nitrogen to the value of about \$80,000,000. He was impressed with the Dublin process for utilizing the manurial value of sludge, which consists of two operations, as follows: (1) The fermenting of the crude sludge mixed with a small percentage of yeast, and the separation of as much water as possible by this means, and (2) drying the resulting sludge, mixed in this case with certain compounds containing phosphates and potash to produce a balanced fertilizer.

The present position of the sewage disposal problem, G. J. FOWLER (*Engineer* [London], 117 (1914), No. 3036, p. 272; *Surveyor*, 45 (1914), No. 1157, pp. 504-506; *abs. in Wasser u. Abwasser*, 8 (1914), No. 7, pp. 417, 418).—The author discusses the sanitary aspects of sewage disposal and takes up briefly the conditions permitting the profitable use of sewage sludge as fertilizer.

It is pointed out that Manchester, Bradford, and other towns in the British Isles are now exporting dried sewage manure at a profit which indicates a great demand for properly prepared sewage manure, either alone or as a basis for enrichment with artificial manures. The Emscher tank, it is stated, produced an inoffensive residue which was useful as a light manure and could easily be enriched. In the Dublin process described above the fermented sludge was dried and sold at about \$12 per ton. The author anticipates the time when it will be possible to purify sewage completely in a tank, with the production of inoffensive sludge which can be disposed of as a manure.

Sludge disposal, J. H. KERSHAW (*Sanit. Rec.*, 53 (1914), Nos. 1265, pp. 209, 210; 1266, pp. 229, 230).—Methods of sludge disposal are briefly discussed.

Among those to which particular attention is given is the utilization of sludge for agricultural purposes. It is stated that sewage sludge has long been known to be a useful fertilizer, but in the author's opinion its value for this purpose has been overrated and it has recently come into more or less disfavor as a fertilizer because it has not produced the anticipated results or has not been put into good condition for such use. It is pointed out particularly that the sludge is not likely to contain as much ammonia as has often been assumed.

An analysis of a sample of air-dried sludge is reported which shows 44.6 per cent of water with traces of ammonia, 23.38 of soluble matter, 19.34 of organic matter, 5.1 of iron and aluminum oxids, 0.77 of phosphoric acid, 6.81 of lime, magnesia, etc., and 0.4 of nitrogen.

Imhoff sewage tank and proposed sewage farm for Torrance, Cal., R. BENNETT (*Engin. News*, 70 (1913), No. 23, pp. 1132, 1133, fig. 1; *abs. in Wasser u. Abwasser*, 8 (1914), No. 7, pp. 422, 423, fig. 1).—A brief description is given of a sewage disposal plant, consisting of an Imhoff tank capable of serving 2,500 people at a daily per capita sewage flow of 75 gal., and a 40-acre sewage farm, the soil of which is light sandy loam. The tank effluent is pumped from a gathering well directly to the sewage farm.

Vacuum cleaning systems, M. S. COOLEY (*New York, 1913, pp. 240, figs. 105; rev. in Engin. Rec. 69 (1914), No. 8, p. 234*).—This is a treatise on the principles and practice of mechanical cleaning.

RURAL ECONOMICS.

Some important factors for success in general farming and in dairy farming, G. F. WARREN (*New York Cornell Sta. Bul. 349 (1914), pp. 657-702, figs. 3*).—For eight years the department of farm management has been studying farms in New York State in order to learn why some farms were paying better than others. Records were obtained from six townships in Tompkins County, five in northern Livingston County, and five in Jefferson County, as well as from a considerable number of farms in different parts of the State, making a total of 2,743 farms.

Among the conclusions reached by the author from a study of these farms were that on the great majority of farms the area in crops, the yield of these crops, the returns per animal, and the diversity of the business are the most important factors. The most profitable general or dairy farms have from 150 to 300 acres of land with from 100 to 200 acres in crops. For this type of farm from 80 to 100 acres of crops is about the minimum area that will make good use of a fair equipment and the horses that go with it. Some farmers whose crops are below the average do very well, but those who make the highest profits usually have crops that are better than their neighbors raise, and apparently it pays to produce crops at least a fifth better than the neighbors raise on similar soil. On dairy farms there is no factor more important than the receipts per cow. Apparently the cows must be about a half better than the average if they are to contribute to the success of the farm. Ordinarily there should be three or four products, no one of which is neglected for the other. If a farmer is doing well in one of the above points but not so well in some of the others he is likely to get greater returns for a given effort by strengthening the weak points and making a well balanced farm rather than by spending more on the thing that is already good.

Letters from settlers and reports from the seed distribution (*Alaska Stas. Rpt. 1913, pp. 60-74, pl. 1*).—Extracts from letters from settlers and other persons telling of their success with various crops and live stock and discussing the possibilities and drawbacks of agriculture in Alaska are here presented.

Small industries among women in the rural districts (*Vie Agr. et Rurale, 3 (1914), No. 34, p. 194*).—Social necessities oblige the rural women of certain European countries to seek out a lucrative occupation, and among the various occupations carried on by them are work in wood, metal, lace making, embroidery, and lingerie. In some places schools have been giving courses to encourage this work and central selling agencies have been established to dispose of their products.

How housewives can cooperate, J. HEATH (*N. Y. Dept. Agr. Bul. 60 (1914), pp. 1530-1537, pl. 1*).—The author found that women purchase most of the farm products sold on the city markets but know very little about their production or distribution. He claims that there is a profession of consumption as well as of production, and believes that the city women should be trained in cooperative consumption as well as the farmer in cooperative production.

Report of the Mayor's Market Commission of New York City (*New York City, 1913, pp. 311, pls. 8*).—This report describes market conditions as found in New York City by the commission and outlines the changes recommended for the distribution of farm products within the city.

The commission considers that the problem of marketing farm products in the city is a problem of distribution from transportation terminals. It can be made efficient only by the coordination of the collection, transportation, and distribution of foodstuffs. There must be developed the type of market that will make for the quickest receipt and disposal of goods, as such a market will encourage producers to ship to it. Shippers must be educated to the advantages and needs of this market and methods employed by them to insure quick marketing of their goods, while the buying public should learn to watch market conditions so that it may buy more intelligently and there may be a popular demand for goods when they are plentiful. The report also describes public markets in American and foreign cities, and discusses transportation in its relation to retail prices, waterways and cost of living, refrigeration at market centers, and the grading, packing, and marketing of farm produce.

An outline of the development of the internal commerce of the United States, 1789-1900, T. W. VAN METRE (*Thesis, Univ. Penn., 1913, pp. 30*).—The author calls attention to the fact that between 1830 and 1860 the manufacturing and commercial population of the Northeast was fed largely by the farm products of the Central States, while the inhabitants of the Central States drew their clothing, shoes, and large quantities of other manufactured goods and general merchandise from the Eastern States. The South relied upon the North for manufactures and a considerable part of its food, while the North in turn bought from the South raw materials for its cotton and sugar industries. The period from 1860-1900 was one of development and exploitation. The extension of the railway system permitted the constant growth of agriculture and rendered accessible the mineral and forest products in which the land abounded; cheap and plentiful raw materials from field, mine, and forest made possible a phenomenal increase of manufacturing. Throughout the whole paper the importance of the development of transportation facilities in developing the agriculture of the country is emphasized.

The agricultural outlook (*U. S. Dept. Agr., Farmers' Bul. 615 (1914), pp. 1-17, 22-41, figs. 5*).—The month of July was very unfavorable for crop growth in the United States, the composite condition of all crops on August 1 being 2 per cent below their 10-year average, whereas on July 1 prospects were 1.4 per cent above the 10-year average. There are contained in this report the usual comments on the condition of the crops in the different States, and also a general summary of the outlook for the 1914 foreign wheat crop. It is maintained that although the wheat crop in European countries is below that of last year the disturbed political conditions are enforcing, in the midst of harvest, widespread abandonment of the fields by the male population of military age, and the saving of standing wheat and other unharvested crops promises to devolve largely upon female and youthful labor.

An inquiry to determine the percentage of the apples shipped in carload lots indicates that 81 per cent of the apples received at the principal cities were so shipped.

The exports of durum wheat from the United States and the receipts at five primary markets were nearly 2,000,000 bushels less in 1913 than in 1914.

Statistical tables are included showing conditions for practically all the farm crops, prices paid to producers of farm crops, range of prices of agricultural products at market centers, and the estimated production of corn, wheat, oats, barley, rye, buckwheat, potatoes, flax, rice, tobacco, hay, and clover.

The agricultural outlook (*U. S. Dept. Agr., Farmers' Bul. 620 (1914), pp. 39, figs. 5*).—The composite condition of all crops September 1 was 2.1 per cent

below the 10-year September 1 average, whereas the August 1 condition was 2 per cent below the August 1, 10-year average.

The yield of honey per colony in this country is estimated at 31.6 lbs. in 1914, and 40.6 lbs. in 1913. Of the honey produced in 1914, 41.7 per cent was comb, 42.1 per cent extract, and 16.2 per cent chunk.

An account of the Washington conference on cotton conditions, August 24 and 25, is given by C. J. Brand, in which he states that last year approximately 8,700,000 bales of the 14,000,000-bale crop went into foreign commerce, and 7,000,000 bales to countries now at war. The general opinion of the representatives of the producing, banking, manufacturing, and other interests represented at this congress indicated that between 4,000,000 and 5,000,000 bales of this would have to be cared for in some way by the American people, and several expedients are described. Some suggestions as to the methods of picking and handling cotton in order to market it at the best advantage are also included.

C. W. Moomaw also has an article on the marketing of the apple crop. He concludes that since fruit is somewhat of a luxury in the countries now at war the foreign demand for apples will be very limited, and practically all the crop will have to be consumed at home. He outlines the methods for judicious handling of the apple crop from time of picking to its arrival on the market. He also recommends that the marketing of apples be distributed over as long a season as possible.

Statistical tables are included showing the condition, production, and prices of corn, wheat, flaxseed, oats, barley, potatoes, sweet potatoes, and hay, and the condition of tobacco, rice, buckwheat, and other minor crops. Statistical tables are also shown giving the prices paid to farmers for farm products and the range of prices at large market centers.

Supply of cattle hides, G. K. HOLMES (*U. S. Dept. Agr., Farmers' Bul. 615 (1914), pp. 17-22*).—In 1909, 20,516,332 cattle hides were treated in the United States, of which 13,764,686 were taken off the cattle of this country. In that fiscal year 192,252,000 lbs. were imported and in the fiscal year 1914, 279,769,000 lbs. The principal source of imports in 1913 were Argentina, Canada, and Mexico. Cattle hides from countries now at war comprise about one-fourth of the total imports, but a large portion of these hides are imported into Europe to be reexported. The decreased marketing of cattle in the United States indicates a diminishing hide production and an increased dependence upon foreign hides. The supply of the United States from foreign countries under European war conditions is subject to diversions and interruptions, but cattle hides will continue to be imported if the means of ocean transportation are sufficient.

The evolution of the price of meat in Munich since the beginning of the nineteenth century and its cause, C. GSCHWENDTNER (*Die Entwicklung der Münchener Fleischpreise seit Beginn des 19. Jahrhunderts und ihre Ursachen. Munich, 1911, pp. 76, pl. 1, fig. 1*).—This study is based upon the wholesale prices of meat. Among the causes of increases mentioned are the rise in cost of production of agricultural products in general, in the cost of labor to butcher, changes in the value of gold, and differences in the character of meat animals at the beginning and ending of the period. Statistical tables are included showing the prices for meat, wheat, rye, wheat flour, and bread.

AGRICULTURAL EDUCATION.

The Agricultural Instruction Act (*Ottawa: Dept. Agr., 1914, pp. 12*).—This pamphlet contains the text of the Agricultural Instruction Act (E. S. R., 29, p.

198), approved June 6, 1913, and an explanatory speech by the minister of agriculture on introducing the bill in the House of Commons on January 24, 1913.

[Agricultural education in Canada] (*Agr. Gaz. Canada*, 1 (1914), No. 3, pp. 145-230, figs. 9).—This number contains an account of the organization, buildings, equipment, and courses offered by the Manitoba Agricultural College, school fairs and domestic science work in various provinces of Canada, short courses in Nova Scotia, agricultural instruction in Saskatchewan and Alberta, and educative and demonstration work undertaken in British Columbia under provisions of the Agricultural Instruction Act.

Agricultural departments and agricultural colleges, J. C. MILLER (In *Rural Schools in Canada*. New York: Teachers' Col., Columbia Univ., 1913, pp. 130-142).—A brief statement is given of the general work of the agricultural departments and colleges in Canada, followed by a discussion as to the development of a new type of publication to be of use to the farmers and their children as well as to teachers, the attitudes of those in the teaching profession individually and institutionally toward the educational efforts of the agricultural departments and colleges, the former not being regarded as having measured up to their opportunities in aiding the work of the latter, and the problem of providing for the education of rural young people from 12 to 16 or 18 years of age, this being deemed the weakest link in the rural education chain in Canada.

Report of agricultural and housekeeping schools for 1912-13 (*Aarsber. Offentl. Foranst. Landbr. Fremme*, 1913, II, pp. 342).—This is a report on the faculty, students, and courses of instruction of the agricultural and housekeeping schools in Norway and also on the farm work and receipts and expenditures of the agricultural schools.

Agricultural home economics instruction in the Netherlands, S. R. v. RAMULT (*Land. u. Forstw. Unterrichts Ztg.*, 28 (1914), No. 1, pp. 56-60).—The author gives an account of the status of this instruction in the Netherlands.

The organization of the state agricultural institute at Spalato, J. SLAUS-KANTSCHIEDER (*Land. u. Forstw. Unterrichts Ztg.*, 28 (1914), No. 1, pp. 1-38).—This article gives a detailed description of the equipment, course of instruction, and rules and regulations of the institute, and a review of its work for the years 1907-1913, inclusive.

The Institute for Fermentation Industries and Starch Manufacture in Berlin.—Contributions to its history and organization, W. ROMMEL (*Das Institut für Gärungsgewerbe und Stärkefabrikation zu Berlin. Beiträge zur Geschichte und Organisation*. Berlin, 1912, pp. 55, figs. 25).—An account is given of the history and organization of the institute, the work and problems of its various divisions, its publications, courses of instruction, and examination regulations, as well as a description of its buildings, and student statistics.

Problems and aims of an imperial federation of Austrian agricultural teachers, V. GÖHLERT (*Land. u. Forstw. Unterrichts Ztg.*, 28 (1914), No. 1, pp. 39-46).—The author thinks that the profession of agricultural teaching can be promoted materially by the adequate organization of agricultural teachers, as is shown by the activities of associations of agricultural teachers in various Austrian States, particulars concerning which are given including some of the problems which they have in general. The problems to be solved by an imperial federation are discussed. Preliminary steps for the creation of such a federation have been taken in Austria.

Project for the foundation and regulation of colonies of agricultural school graduates, M. C. MARTINEZ (*Min. Agr. [Argentina], Dir. Gen. Enseñanza Agr. [Pub.]*, No. 65 (1914), pp. 35, pl. 1, fig. 1).—This is an outline of a project

submitted to the Board of General Direction of Agricultural Education of Argentina for the colonization of graduates of agricultural schools on government lands in various parts of the country, followed by opinions of the press concerning it.

Purpose and organization of the seminar for farmers in Königsberg (Neumark), LUBERG (*Jahrb. Deut. Landw. Gesell.*, 29 (1914), No. 1, pp. 198-203).—An account is given of the object and organization of the seminar for farmers at Königsberg which has been established for the purpose of giving a theoretical training in agriculture to farm owners, renters, and particularly estate officials, in as short a time as possible. The instruction is given by means of lectures in agricultural chemistry and mineralogy, physics and meteorology, plant production and bacteriology, animal production, chemical and microscopical practicum, general crop production and fertilizers, machinery, special plant production, animal breeding and dairying, management and taxation, bookkeeping, political economy and commerce, administration and law, veterinary medicine and farriery, architecture, surveying and leveling, forestry, fishery, horticulture, and fruit and vegetable growing. These lectures are followed by discussions and criticism by the students and are supplemented by excursions and such advanced farm practicums as mechanical soil analysis, determination of lime in soils, the fat content and adulteration of milk, of water content and margarin in butter, of the weight, germination, adulteration, and impurities of seeds, starch content of potatoes, sugar content of beets, hardness of water, tests of fertilizers and feeding stuffs, etc. The instruction extends through $10\frac{1}{2}$ months, 34 hours a week, of which over $1\frac{1}{2}$ to 2 hours a week are devoted to the practicums. A 5-year practical experience is required for admission. A similar seminar is in operation at Schweidnitz.

How to organize and conduct a girls' canning club, BIRDIE I. ROBINSON (*Alabama Col. Sta. Circ.* 23 (1913), pp. 16, figs. 6).—The author points out the object of girls' canning clubs and the commercial value of the work, and outlines a plan of organization, constitution, by-laws, etc. An outline for an illustrated booklet or history of girls' garden and canning work, by O. H. Benson, is included.

Information on corn growing for corn club boys, L. N. DUNCAN and J. B. HOBDY (*Alabama Col. Sta. Circ.* 24 (1913), pp. 10, figs. 5).—Instruction is given on the selection of seed corn, preparation of seed bed and planting, fertilization, and cultivation.

Alabama Boys' Corn Club Day, L. N. DUNCAN and J. B. HOBDY (*Alabama Col. Sta. Circ.* 22 (1913), pp. 16).—This circular outlines a program, a suggested constitution and by-laws, and other essentials for a school corn club.

MISCELLANEOUS.

Annual Report of Alaska Stations, 1913 (*Alaska Stas. Rpt.* 1913, pp. 80, pls. 15).—This contains the organization list and a report of the several lines of work carried on during the fiscal year ended June 30, 1913. Meteorological data and accounts of the extensive tests with field and garden crops and of other lines of work are abstrated elsewhere in this issue.

Annual report of the director of the experiment station on work done under the local experiment law in 1913, J. F. DUGGAR (*Alabama Col. Sta. Circ.* 25 (1914), pp. 3-40).—This includes the text of the law (E. S. R., 24, p. 400), a report by the director on the organization and progress of the work under its provisions, a financial statement for the year, and reports from heads of departments, including detailed reports as to boys' and girls' club work.

NOTES.

Arizona University.—The extension service has begun a monthly publication known as the *Arizona Farm Advisor* and designed to furnish popular information on timely farm topics. The first issue is devoted to the Arizona farmer's bookshelf, and gives a list of publications recommended. Other numbers give information as to the annual farmers' short course held January 4-16, soil fertility, control of codling moth, and the work of boys' and girls' clubs.

A. L. Paschal has been appointed farm demonstrator for Cochise and Santa Cruz counties.

Connecticut State Station.—D. F. Jones, instructor in horticulture at Syracuse University and formerly connected with the Arizona Station, has been appointed plant breeder vice H. K. Hayes, whose resignation has been noted.

Illinois University and Station.—A laboratory for cheese making, butter making, and separating, has recently been fitted up. The old stock-judging pavilion has been converted into a combined laboratory for animal nutrition and a dairy laboratory, holding about 140, with smaller laboratories and offices.

Dr. James Harvey Pettit, professor of soil fertility in the college of agriculture and chief of soil fertility in the station, died December 30, 1914, at Pasadena, Cal., at the age of 38 years. Doctor Pettit was graduated at Cornell University in 1900 and received the Ph. D. degree at Göttingen in 1909. He has been associated with the university and station since 1901. His work is summarized in a recent number of the *Illinois Agriculturist* as follows:

"Dr. Pettit's distinctive service has been in connection with the soil fertility investigations, he having been identified with this work almost from its beginning at the university. He has made various important contributions to the advancement of this subject, particularly in connection with its chemical aspects. In the experiment station he was in direct charge of the analytical work of the soil survey. As an instructor in the college as well as in his extension service over the State he was an ardent teacher of the principles of permanent agriculture."

Missouri University.—James G. Watson, of the extension service of the Iowa College, has been appointed extension assistant professor of dairy husbandry, beginning January 8. George W. Reavis, who has been for four years connected with the office of the state superintendent of public instruction, has been appointed supervisor of boys' and girls' clubs, beginning December 9, 1914.

Montana College and Station.—C. C. Starring, horticulturist at the Hood River substation in Oregon, has been appointed assistant horticulturist, beginning January 1.

Nevada University and Station.—The station library has been consolidated with that of the university in the new library building, where, however, it occupies a small room to itself. This transfer has permitted the fitting up of the old station library room as a laboratory.

The new station bacteriological laboratory is nearing completion and will be utilized in studies of atypical anthrax, which is causing serious losses among cattle, and the control of contagious epithelioma in fowls. Dr. E. Records has been appointed bacteriologist in the station.

Cornell University.—Bristow Adams, in charge of the information division of the Forest Service of this Department, has accepted an appointment as head of the new department of information in the college of agriculture and has entered upon his duties. E. G. Misner has been appointed instructor in extension teaching. Of the 1914 graduates, T. A. Baker has been appointed assistant in animal husbandry and L. E. Harvey and William I. Myers assistants in farm management.

New York State Station.—Clarence D. Parker and Allen K. Burke have resigned as assistant chemists, the former to enter the U. S. Geological Survey, and the latter to engage in commercial work.

Oklahoma College and Station.—W. L. Carlyle, formerly director of the Idaho Station, has been appointed director of the station and dean of the agricultural work, and has entered upon his duties.

A. F. Rolf has resigned as head of the poultry department to engage in livestock extension work in Louisiana.

Oregon College and Station.—A conference of Pacific Coast horticulturists was called by Governor West at the college early in December, 1914, to consider legislation designed to secure uniformity in inspection laws to protect growers against the introduction and spread of insect and disease pests, both within the States and from other States. Commissioners of horticulture from each of the States were in attendance, and the joint committee appointed to draft the proposed measures called to their assistance experts from the college to assist them.

Dr. James Withycombe, former director of the station, was elected Governor of Oregon at the last election by the heaviest majority ever accorded a gubernatorial candidate in the State.

Dr. Hector Macpherson, head of the newly established college bureau of farm organization and management, has been elected chairman of a commission appointed by Governor West to prepare a draft of a rural credits bill for presentation to the next legislature.

C. S. Brewster has accepted an appointment as research assistant in poultry and R. B. Thompson as foreman of the poultry plant.

Washington College and Station.—Dr. E. A. Bryan, president of the college for the past 22 years, has resigned to take effect January 1, 1916. Dr. F. D. Heald, former pathologist in the Pennsylvania chestnut blight investigations, has been appointed professor of plant pathology in the college and plant pathologist in the station.

West Virginia University and Station.—E. D. Sanderson, dean of the college of agriculture and director of the station, has resigned to take effect September 1, when he expects to pursue graduate studies.

Society for the Promotion of Agricultural Science.—At the thirty-fifth annual meeting of the society, held at Washington, D. C., November 10, 1914, the following papers were read and discussed:

The Massachusetts State Forestry Work was presented by F. W. Rane. It was asserted that the general forest propaganda in the United States is too exclusively academic, and is not pushed energetically enough to give results in actual reforestation and forest extension. Details of the Massachusetts forestry work were discussed at length, including regulations regarding fire wardens, State purchase of unproductive lands, etc.

In a paper on the Nitrifying Powers of Soils as Indices to Their Fertility, by C. B. Lipman, attention was called to the fact that good soils commonly have a high nitrifying power but that it is uncertain whether this nitrifying power is a cause or an effect. Unusually fertile spots of soil in certain grain fields in California were found to possess a high nitrifying power, and also more citric-acid-soluble phosphoric acid and potash than the surrounding area. The nitrifying power was as much as six times greater than that in poor soils. It was suggested that the spots possessing high nitrifying power were perhaps the result of the admixture of animal feces, burnt straw, or of a balanced soil solution. Evidence was presented that a low nitrifying power of soils may cause various physiological diseases in plants.

According to the findings of G. S. Fraps, who read a paper on Nitrification and Soil Fertility, nitric nitrogen in soils is in general proportional to the total nitrogen. If soils are heavily cropped the nitric nitrogen becomes disproportionately low, indicating that some parts of the soil nitrogen are more easily nitrified than others.

W. G. Sackett, in a paper on The Pigment of *Azotobacter chroococcum*, stated that peculiar brown spots are appearing on the surface of soils in various localities in Colorado and are increasing in extent. These spots are rich in nitrates and are toxic to trees and other plants. The nitrates are apparently formed in situ. *A. chroococcum* is abundant in the periphery of such spots. Experiments with agar media, differing from each other in the absence of one of the salts contained in the soil of the brown spots, showed that a dark brown pigment was always developed in the presence of carbon and sodium nitrate. It appears that the color of the soil spots is due to the solution of the pigment of *A. chroococcum* by the soil water.

C. G. Williams presented some recent studies on Variation in Pure Lines of Wheat, during which it was found that the length of head in pure lines of breeding is apparently not a hereditary character. Attempts to fix a tendency to produce large or small kernels gave variable but for the most part negative results. A long-continued effort to increase the protein content of wheat by selection within a pure line yielded no encouragement for such work.

The claims of The Small Field Laboratory and Its Atmosphere of Research were presented by D. Fairchild. In large laboratories the investigator is exposed to too much noise, distracting occurrences, and interruptions, due to students and casual visitors. He also becomes burdened with administrative details, all quite foreign to research. Moreover, the laboratory is far removed from the source of the material which he is studying. The small laboratory on the contrary is quiet. There is no unnecessary apparatus or interruption or executive duties. It may be placed in the midst of the material to be studied.

In a paper on the Relationships of Experiment Station Work and Agricultural Extension, F. B. Linfield presented a number of considerations showing how these lines of work come in contact with each other in various parts of the agricultural field.

The County Experiment Farm was discussed by C. E. Thorne, who recounted the difficulties in attempts to carry on cooperative experiments with farmers, and urged that it is much better to have county farms where work can be prosecuted continuously. In Ohio the experiment farms are under the joint supervision of the College of Agriculture and the Ohio Station.

H. P. Armsby presented a paper on the Influence of Quantity of Feed Upon Digestion. It has been found that the amount of methane formed per kilogram of dry matter eaten is much greater on light than on heavy rations. This indicates an increased bacterial fermentation of carbohydrates. A larger percentage of the feed energy was found to be excreted in the urine on light rations, the

excess consisting probably of nonnitrogenous substances. In general, feed is apparently more digestible in small than in large rations.

Experiment Station Research as Seen From Within and Without was discussed by H. J. Wheeler, who advised reaching the urban population by newspaper publicity, and giving more attention to cooperative experiments on the farms throughout each State. He also urged the need of more research on the difficult and fundamental problems of agriculture, better training of research men, higher salaries for scientific workers, and a keener sympathy of governing boards and station directors for investigation.

Team Work in Agricultural Science was the subject of a paper by R. J. H. DeLoach. The speaker presented the claims for better organization of stations, and urged the most complete cooperation consistent with the independence of station departments, and the sympathetic working together of the stations and this Department.

Notes on the Progress of Economic Entomology were presented by L. O. Howard. Attention was called to the rapid development of economic entomology in the United States, the widespread cooperation of the Bureau of Entomology with experiment station and foreign entomologists, and the general interest in the federal horticultural quarantine. It was stated that the trend is entomological work is now toward more study of insect biology, and that the distinction between entomology and phytopathology or parasitology should be held in mind.

The usual joint evening session was held with the American Society of Agronomy at which the presidential addresses of the two societies were delivered. That of President H. J. Waters, of the Society for the Promotion of Agricultural Science, dealt especially with corn as a feeding stuff, showing some of its deficiencies, notably protein, and attempts to find supplements to enable pigs to utilize effectively the nutrients in corn. The address before the American Society of Agronomy, entitled *Fundamental Principles in Agronomy*, was given by C. V. Piper. This will be noted later, in the report of the meeting of that society.

Officers were elected for the ensuing year as follows: President, H. J. Waters, of Kansas; vice president, C. E. Thorne, of Ohio, secretary; L. A. Clinton, of the United States Department of Agriculture; custodian, W. D. Hurd, of Massachusetts; and member of the executive committee, David Fairchild, of the United States Department of Agriculture.

American Association of Farmers' Institute Workers.—The nineteenth annual meeting of this association, at Washington, D. C., November 9–11, 1914, attracted an attendance of about 150. The program followed the lines of recent years but special prominence was given to the relations of farmers' institutes to other agencies.

The presidential address of Edward Van Alstyne, of New York, reviewed the many useful results achieved by the farmers' institutes of the past, drew attention to the fact that the attendance for the past year was by far the largest ever secured, and expressed the belief that the institutes are needed in this country for at least a generation. C. B. Smith, discussing *The Relation of Farm Bureaus to Farmers' Institute Work*, regarded the farmers' institute as the forerunner of the county bureau but believed that the latter will eventually be so developed as to cover substantially the same ground, and will have the added advantages of all the year operation and of larger resources at its disposal. C. H. Tuck, of Cornell University, believed development of the spirit of cooperation among extension agencies would be most effective, and he would federate all agricultural interests with a committee organization.

Hon. Carl Vrooman, Assistant Secretary of Agriculture, addressed the association on the *Work of the United States Department of Agriculture for Farm-*

ers' Institutes. In this address he called attention to the increased efforts on the part of the Department to disseminate agricultural information, and pointed out what he regarded as some of the specific needs in agriculture at the present time. Dean E. Davenport, of Illinois, read a paper on Recent Progress in Agriculture. Among recent developments he indicated the trend from studies of problems in production to those in economics and sociology. He predicted that the Smith-Lever Act would insure the perpetuation of the stations as research agencies.

President K. L. Butterfield discussed the Relations of Farmers' Institutes to Rural Sociology, taking the ground that the institutes had rendered valuable service in stimulating the desire for the betterment of rural conditions. Other addresses on the program included the following:

Improving our Institute Organization and Methods, by A. P. Sandles, of Ohio; Rural Organizations for Women, by Mrs. Ida S. Harrington, of Rhode Island; The Function of Farmers' Institutes in Promoting Cooperation Among Farmers, by E. B. Dorsett, of Pennsylvania; Promoting Cooperation through Farmers' Institutes, by A. D. Wilson, of Minnesota; Systematic Instruction in the Rural Districts, by G. A. Putnam, of Ontario; Helping Farm Women, by Mrs. Mary E. Dillard, of Virginia; The Relation of Home Economics to Farmers' Institutes, by Miss Winifred J. Robinson, of Delaware; Teaching Home Economics at Farmers' Institutes, by Miss Anna Barrows, of New York; and Songs that Live, by Miss Rose Morgan, of New York, this last maintaining that the country should develop its own standards for music, and that the cultivation of the taste for good music may be a strong factor in keeping the boys and girls on the farm.

The report of the farmers' institute specialist of this Department, J. M. Stedman, included statistical data as to the progress of the work during the past year. A total of 25,338 half-day sessions were reported, with a total attendance of 3,656,381 persons, or 145 per session. Although data as to the sessions and attendance of movable schools were not included in these figures as in previous years, and the total appropriation of \$456,647.51 showed a decrease of over \$50,000, an increase over 1913 of about 20 per cent in the number of sessions and attendance of the institutes was indicated.

Officers for the ensuing year were chosen as follows: President, T. B. Parker, of North Carolina; vice-president, G. A. Gigault, of Quebec; secretary-treasurer, L. R. Taft, of Michigan; and executive committee, Edward Van Alstyne, of New York, A. P. Sandles, of Ohio, and Mrs. Henrietta W. Calvin, of Oregon.

American Society of Animal Production.—This society held its sixth annual meeting at Washington, D. C., November 10 and 11, 1914.

W. A. Cochel of Kansas opened the sessions with a paper dealing with the causes of the deficiency in the meat supply. He suggested as some of the probable remedies the long-term lease to tenants, better financial facilities, the establishment of more uniform market values, the lessening of the cost of production by the use of home-grown roughage and waste products, and more definite information on methods of management of the breeding herd.

B. O. Severson reported experiments at the Pennsylvania Station on the cost of maintaining a beef-breeding herd, and the influence of the feeding of cottonseed meal on the calving ability of cows. Colorimeter tests with cattle were reported by H. P. Armsby, in which he ascribed the increased metabolism of standing cattle over those lying down, of those on heavy ration as compared with those on light ration, and of scrub (nervous) cattle over pure-bred (placid) cattle to nervous stimulation rather than to direct digestive processes, the feed rather than muscular exertion appearing to be the determining factor.

A paper entitled *Composition of Steers at Various Stages of Growth from Birth to 1,500 lbs.*, was presented by T. L. Haecker, in which he stated that in seven years' experiments at the Minnesota Station it was found that the percentage of water in the body of growing steers decreased very rapidly with a corresponding increase in the fat content. The percentage of ash remained practically the same, while there was a slight decrease in the percentage of protein.

The optimum amount of cotton-seed meal for beef cattle as determined by experiments at the Tennessee Station was discussed by C. A. Willson. F. G. King stated that from the results of experiments at the Indiana Station it was evident that the efficiency of a ration for fattening steers was not materially affected by the nutritive ratio so long as this ratio was within reasonable limits, about 1:7, but that succulence and palatability of feed were very important.

J. W. Hammond discussed the studies carried on at the Ohio Station on the inheritance of wooling ability in sheep, and the effect of rations of high, low, and medium nutritive ratio upon the quality and yield of wool.

A paper by T. F. Trowbridge gave data as to comparative weights and composition of various parts of the bovine fetus, and showing the percentages of flesh, of hair and hide, of skeleton, and of internal organs to the live animal.

L. D. Hall of this Department outlined the work of the Office of Markets in its efforts to facilitate the distribution of animal products, and to minimize the waste incident to transportation. Cooperative and other systems of marketing are being studied with a view to supplying meat producers with definite information on the most efficient methods to be practiced.

In discussing the milk records of the dairy herd of the North Carolina Station J. C. McNutt stated that he attributed the marked improvement in yield in the past four years to the use of cotton-seed meal. This, he said, had had no deleterious effect upon cows, but instead appeared to be highly efficient.

E. S. Savage told of his efforts to harmonize the various feeding standards, and discussed the importance of animal husbandmen adopting some uniform feed values. He preferred the Armsby standard for accuracy and simplicity.

J. M. Evvard discussed the efficiency of the self-feeder in the feeding of swine as determined by several years' trials at the Iowa Station.

L. W. Fetzer of this Office presented a paper entitled *Some Pathological Aspects of Animal Nutrition*, in which he discussed the pathological influence of various feeds such as cotton-seed meal, molasses, and spoiled feeds upon the animal organism. He emphasized the importance of selecting animals for the experimental feed lot that were free from disease, and described methods of testing for tuberculosis, abortion, and other diseases that might materially affect the feed lot results.

From cattle feeding trials conducted at the New Mexico Station, F. W. Christensen concluded that there was no superiority of one age over another as to digestive ability. Per 1,000 lbs. live weight there was no relation in the amount of food consumed for the different ages, and submaintenance periods of some of the cattle appeared not to impair their digestive ability.

Methods of feeding sugar beet products, their feeding value, and pathological effects were treated in a paper by G. E. Morton. H. S. Grindley reviewed Bulletin 165 of the Illinois Station (E. S. R., 30, p. 369), discussing methods of improving the ordinary feeding standard.

The importance of protein in egg production was discussed by H. R. Lewis in which he showed that a protein from an animal source was superior to that from a vegetable source for maximum production, and that the size and weight of eggs was materially affected by such feeding.

E. W. Morse of this Department spoke on the necessity for standardizing feeding tests, and stated that while metabolism experiments are important in

reaching some scientific basis for feeding operations, there is still a large field for the ordinary comparative feeding trial.

President E. B. Forbes concluded the program in a paper outlining the development of the association, stating that it had arisen out of the need by animal husbandmen for some central organization, but that the original purpose of cooperation in experimental work had been modified in recognizing the element of competition which appeared to be an unavoidable and possibly desirable characteristic of station work. He stated that in recognizing this changed aspect the society was now better prepared to accomplish some practical results, and suggested the appointment of a referee committee which should consider the special problems arising and make recommendations at the next annual meeting. The appointment of this committee was subsequently authorized.

Recommendations looking toward the elimination of unnecessary variable factors in feeding trials, presented by E. W. Morse at the last annual meeting and referred to the committee on experiments, were found suggestive. The committee on agricultural instruction proposed that the next meeting be devoted largely to papers on agricultural teaching and suggested topics to be discussed. The committee on terminology of feeding experiments gave an extended report recommending a uniform method of conducting slaughter analyses of experimental animals, and recommending so far as feasible the adoption of definitions of feedstuffs as used by the Association of Feed Control Officials. Other animal husbandry and nutritional terms were defined and recommended for adoption. The standardization of statistical methods was suggested.

Officers for the ensuing year were elected as follows: President, E. B. Forbes, of Ohio; vice president, W. A. Cochel, of Kansas; and secretary-treasurer, F. B. Morrison, of Wisconsin.

Miscellaneous.—The rural education conference of Great Britain, constituted in June, 1910, for three years, has now been succeeded by the agricultural education conference, with Lord Barnard as president, and H. L. French, of the Board of Agriculture and Fisheries, as secretary. This conference will act in an advisory capacity on questions pertaining to agricultural education.

According to a note in *Nature*, the general committee which is promoting the establishment of an Imperial College of Tropical Agriculture, has decided to attempt to raise \$200,000 for buildings and endowment, of which half will be sought from official sources. The location of the institution has not yet been decided upon, but the committee favors Ceylon.

The death in the European war is announced of Dr. Franz Marshall, director of the experimental laboratory of the Agricultural Institute of the University of Halle; Dr. Franz Waterstradt, professor of agriculture in the agricultural school at Hohenheim; and André Vuillet, well known in this country for his publications on the gipsy moth and its parasites.

Dr. M. C. Cooke, the well-known English mycologist, died November 12, 1914, in his ninetieth year.

Dr. Jacob Eriksson has resigned as chief of the phytopathological experiment station at Stockholm, Sweden.

EXPERIMENT STATION RECORD.

VOL. XXXII.

FEBRUARY, 1915.

No. 2.

The Philadelphia meeting of the American Association for the Advancement of Science was a notable one for agriculture, for it marked its definite enrollment among the sections of the association. This does not apply specifically to the occupation of agriculture, but as Professor Bailey explained, to "the assembly of scientific research that deals with the problems of the occupation and of the living resulting from the occupation."

As a subject, agriculture has formed a no small part of the proceedings at past meetings, in the sections of botany, chemistry, physiology, economics, etc., and several affiliated societies have concerned themselves with matters more or less agricultural. But at this meeting the subject of agriculture as a department of applied science and as a branch of industry presenting large social, economic, educational, and political problems, was given place in the organization of the association, along with the older abstract sciences, with engineering, with medicine, and with education, and brought into its councils on an equal footing.

This is a great and interesting change, how great those who have been longer in the agricultural work can the more readily comprehend. Time was, and not so long ago, when agriculture as a subject had no place in an association of sciences and would not have received an invitation. The man who should attempt to present a strictly agricultural topic before such an association would have been out of place, because there was so little basis for a thorough scientific treatment, and because agriculture as a subject of general interest to science had not yet won its way. The change which has come is, therefore, a twofold one. It applies to the remarkable scientific advancement of the subject itself, which finds few parallels, as well as to a change of attitude on the part of men of science.

Agriculture has earned a place among the sciences, and having earned it has been recognized and formally admitted into the fellowship of the sciences. This came without solicitation. It will now be for the subject and for the group thus honored to see that

the new section reflects honor and credit upon the association, and becomes a vital agency for the further "advancement of science." A great opportunity is afforded in the new setting to win recognition for the subject, and to attract to it the men of broad scientific training it needs for its steady advancement.

The inauguration of the new section was particularly auspicious. The president of the association, Dr. Charles W. Eliot, honored it by presiding at the opening of the meeting, and in a brief address expressed his approval of the new section and his interest and confidence in the great work for agriculture.

Dr. Eliot thought it was high time that we began to attend to the building up of American agriculture, and making it a higher expression of American efficiency. He saw in the teaching of agriculture an opportunity for furthering a reform clearly needed in American education, namely, the devotion of much more time to the teaching of the natural sciences in the schools. This, he declared, is the great reform needed in American education. The popular interest aroused in agricultural teaching offers an entering wedge in this direction, and gives hope for the accomplishment of even greater reforms.

Country life development he pronounced "one of the greatest humanitarian movements in this age." Our race can not endure urban life and the factory system, he said; the ill effects of it have already been seen. "Hence anything that leads men out into the country where they may live a wholesome existence is contributing to a necessary humanitarian movement."

This was a happy introduction to Prof. L. H. Bailey's vice-presidential address on The Place of Research and of Publicity in the Forthcoming Country Life Development. The address was essentially a plea for democracy, approached from the standpoint of the public service institutions for agriculture, and especially the new national work of agricultural extension.

Taking up the history of the man on the land, Professor Bailey showed how in the nineteenth century "he began to be recognized politically," and institutions were developed on public funds "to train the farmer and to give him voice." Out of this, the great American system for agricultural teaching, investigation, and more recently for extension work, has grown. A strong plea was made for maintaining the necessary balance and check in the future development, and for meeting the demand for careful inquiry.

"There must be a certain relation or equation between the research effort and the teaching effort," he said. "The enlargement of one ought to be conditioned on the enlargement of the other; and cer-

tainly we ought to know before we teach. I hope that the new extension work will demand a great stimulation of research. No subject makes great headway, no people make great progress, unless it rests on investigation and discovery, and feels the stimulation of exploitation in fresh fields. . . .

"The vitality of the extension teaching, as of any other teaching in natural science, will depend on the body of exact knowledge that lies behind it. This being true, we must see that appropriations for extension teaching in the years to come are not out of proportion to appropriations for research. I hope we shall soon find a widespread expression amongst the people for a more complete endowment of fundamental investigation in subjects related to our agricultural industry."

Professor Bailey took occasion to explain the type of research he had in mind—that which "follows a program looking toward a solution;" but he took no narrow or superficial view of it, or of its direct application in practice. His remarks on the subject are interesting:

"It is not necessary to the broad results we seek that this research shall all be directly or immediately applicable to the arts of life. It does not matter if much of it remains practically unknown to the public. The effect of the accumulation of it, if it is good, will be beyond all price, establishing a foundation, providing a reservoir from which we may draw at will, giving us a sense of conquest and of power, developing a literature, and training many men whose judgments will be of the greatest value in the control of our rural affairs. Research in agriculture should look toward a solution, but not necessarily toward a definite application, although the purpose to apply does not make it any the less research or any the less worthy of respect.

"Knowledge applies itself in the end. The best and the final application of it is in a new approach to the subject and a better philosophy of action. This is well illustrated in the great work of Darwin, which we have now learned to apply in a thousand ways, because it has entered into our philosophies. So the accumulation of knowledge touching agriculture will give those who come after us a new grasp on the rural situation, a readjustment of ideas, and confidence in our ability to handle the situation. Good research, maintained continuously and without haste by the ablest men, will make its own application." But because research does not have within itself the elements of publicity, it needs to be guarded by organizations which understand its fundamental importance.

Professor Bailey defined the country life movement, not as a propaganda, but as "the expression of a rapidly crystallizing desire

to make rural life all that it is capable to become, and to understand and to realize in the best way all the natural products of the earth." In the prosecution of the movement he urged that the first principle of democracy should not be lost sight of, "which is to let the control of policies and affairs rest directly back on the people." He cautioned against too strong centralization of authority and administration, but instead urged that the effort should be made a real democratic expression on the part of the people.

This idea was applied particularly to the extension enterprise, where much hope was expressed of the county agent work in furnishing stimulation and guidance, "if the motive power in it is kept with the people." But it was maintained that it "can never produce the background results of which it is capable if it is a strongly entrenched movement pushed out from one center, as from the agricultural college. The college may be the guiding force. But it should not remove responsibility from the people of the localities, or offer them a kind of cooperation that is only the privilege of partaking in the college enterprise." Some of the so-called cooperation in public work was characterized as being "little more than to allow the cooperator to approve what the official administration has done."

Professor Bailey looked to the colleges of agriculture for leadership, and because of this he warned against their assuming any dictatorship. "It is just the moment," he said, "to give the people in the neighborhoods all the freedom and all the responsibility they ought to have for their own best development. The future will care very little for the mechanism of administration, but it will care very much for the results in the training of the folk."

The contention of the paper was tersely summed up in these closing sentences: "Agriculture is in the foundation of the political, economic, and social structure. If we can not develop starting power in the background people we can not maintain it elsewhere. The greatness of all this rural work is to lie in the results and not in the methods that absorb so much of our energy. If agriculture can not be democratic, then there is no democracy."

This address dealt with a vital matter, in which we need all the counsel that can be had at this time. It was suggestive and of unusual interest, and it will be helpful in avoiding some of the dangers. It deserves to be widely read.

There is undoubtedly a danger in the latest phase of going too far—of doing too much for the people, of robbing them of their initiative and the independence on which they need to rely so largely, and of leading them to lean too heavily upon their advisors. The effort may not be stereotyped, and it should be genuinely cooperative with the people themselves. But, on the other hand, there

must be plan and system in all this varied effort to make it effective, and many will feel that there must be a considerable measure of administrative supervision and control to realize for agriculture and the farming people the purpose which was so ably set forth.

The other feature of the initial meeting of the Section of Agriculture was a symposium devoted to The Field of Rural Economics. This was participated in by four speakers, who dealt with several different phases of the general topic.

In opening the subject, Hon. Carl Vrooman, Assistant Secretary of Agriculture, discussed rural economics from the standpoint of the farmer. He corrected some of the false popular impressions as to the advantage of high acre yields, pointing out that the plain business question is not how much the farmer could produce if he had no regard for the cost, but how much he can afford to produce under present American conditions. He showed by statistics that the largest crops do not necessarily mean the largest net income to the farmer, and that in years of relatively small production he often realizes quite as much from his crops as in years of maximum yield.

Secretary Vrooman laid much emphasis on the importance of the problems of distribution and marketing, enforcing his remarks by illustrations from his own experience as a farmer. While frankly admitting the necessity for middlemen and other intermediaries, he protested against any allied interest taking more than a legitimate profit from the farmer. He declared that the average farmer is only making wages; he is not making a profit over his wages and the interest on his investment. Until the problems of agricultural economics are solved there is little encouragement for him in attempting to raise larger crops. Economic justice to the farmer and producing classes, he said, must be the basis of the higher civilization which we picture.

In discussing credit in relation to agriculture, Prof. G. N. Lauman of Cornell University maintained that in this country credit has not been generally available to the farmer except at a considerable premium, and that in order to develop American agriculture and rural life it must be made feasible for a man to be successively a farm laborer, a farm renter, and a farm owner. Short-time credit was held to be a distinctly local matter. The community should rally all its capital to develop itself, and should organize to furnish the basis for a closer association between itself and existing banking and credit facilities. The great social and ethical gains from the small credit unions of Europe was explained, especially in helping the small farmer.

In order to bring outside capital into agriculture it is necessary to meet the demands which such capital makes. Credit, it was declared,

"has no better basis than farm values made fluid." Rightly developed, bonds based on land mortgages have no superiors in the investment field. These, it was explained, should be of small enough denominations to be accessible to all classes, and available on all exchanges. But the prevalent machinery for this is too expensive a burden on agriculture.

Professor Lauman did not advocate leaving the problem to either the government or private capital for solution, but urged organization. "If agriculture organized to make it possible to demand the lowest rates of interest the market affords, can not live and develop, not even state aid will prevent its ultimate decay."

In considering some of the problems of marketing and distribution, Mr. C. J. Brand of this Department, presented the needs of the farmer in the way of assistance in establishing a market system which will return to him the true value of the various grades of crops he produces, minus reasonable charges for handling, transportation, and the legitimate profits of middlemen. He outlined the various lines of study which are being pursued by the Office of Markets and Rural Organization. These are concerned, in part, with a study of conditions as they actually exist over the country in the handling and marketing of special classes of products, with statistical studies of supply and demand. Market grades and standards are also being investigated, with the object of effecting greater uniformity; and transportation and storage, as to methods, the adequacy of facilities, and the relation of warehousing, refrigeration, etc., to prices and to stabilizing supplies.

Market surveys are being made with a view to collecting facts and developing methods for supplying promptly to producers and consumers useful information in regard to prices and supplies. The practice in vogue in marketing and distribution in large cities is the subject of a special inquiry, to make comparisons and arrive at the most advantageous plans. Direct dealing through marketing by parcel post and by express is being studied, not only as to practicability and advantages, but as to systems for bringing producers and consumers into contact and establishing business relations. Co-operative buying and selling naturally attracts considerable attention, with inquiry into the methods and success of organizations, and the supplying of assistance in organization, systems of accounting, auditing, etc.

The partial enumeration of these lines of effort illustrates some of the present problems in marketing. From a consideration of cotton handling and marketing, Mr. Brand showed that the acute problems are not confined to perishable crops. The cantaloup trade was cited to show an overdevelopment of the industry, due to ignorance as to the development of competitive areas, which in 1914 resulted

in disaster to the producers and to the large distributors. The conclusion is that "until we have a more complete system of information and a better adjustment of production to market requirements, this problem will continue to be with us." As usual, the slump in prices was not reflected in the retail trade, consumers paying practically as much as in a year of scarcity, while the surplus went to the dump.

Cooperation was not regarded as necessarily the panacea for marketing troubles. Organization was favored, but alone it is not sufficient; it must be accompanied by skillful and intelligent management. To protect shippers from imposition and misrepresentation at the large markets and terminals, a licensed inspection system was suggested, to examine into and report upon the condition of the products as received, prices at which sold, and otherwise to look after the interests of the shipper.

The distinction between efficiency in production and efficiency in bargaining was brought out in an interesting way by Dr. T. N. Carver, of Harvard University. He explained that every legitimate business is made up of two parts, one of which may be called producing, including any handling of the material which renders it more usable or useful, and the other bargaining—i. e., buying and selling, borrowing and lending. Many of the supposed economies of large scale business turn out upon examination to be advantages in bargaining rather than economies in production. In most lines of business there is a certain size which gives the maximum efficiency in production, and also in bargaining. These do not necessarily coincide, but as a rule the size which gives the maximum efficiency in bargaining is larger than that for production.

In agriculture the most efficient producing unit was said to be the one-family farm, provided with the best teams, tools, and general equipment. This gives the highest average product, man for man. If the large farmer is able to command some special advantages in securing cheap labor, he may beat the small farmer in competition with him, but this is advantage in bargaining. His profit may be larger in spite of the lower average productivity of the persons engaged. The foisting upon the rural districts of a large supply of cheap labor results in giving the large farmer an advantage in purchasing his labor.

Again, it was pointed out that in buying his supplies and in selling his products, especially if they are perishable, the large farmer usually has an advantage. "The small farmer of the present day is the only large class which regularly buys its raw material at retail and sells its finished product at wholesale." This can be overcome by "collective bargaining" or cooperation, which may give the small farmer the same advantages which the large farmer

enjoys; and the same is true in borrowing capital. Hence for the small farmer, who appears to be efficient in production, organization into larger units was urged, to overcome inefficiency in buying and selling.

The meeting of the Section of Agriculture was well attended throughout, the hall assigned to it being filled to its capacity. Fully three hundred people gathered for the opening, and a large proportion remained through the program. This showing of interest was gratifying and encouraging to those connected with the section, as the first meeting was regarded as something of an experiment.

There is no field of scientific research that belongs exclusively to agriculture or to the new section, but there are problems which are primarily agricultural, and as Professor Bailey well said, it is imperative that the attitude of all the sciences be brought to bear on these problems. If this can be furthered by the new section, and the agricultural point of view contributed to some of the discussions of the association, the result will be of mutual advantage.

RECENT WORK IN AGRICULTURAL SCIENCE.

AGRICULTURAL CHEMISTRY—AGROTECHNY.

Justus von Liebig, J. VOLHARD (*Justus von Liebig. Leipsic, 1909, vols. 1, pp. XI+456, pls. 2; 2, pp. VIII+438, pls. 2*).—In recent years biographical data as to von Liebig have been confined largely to lectures before learned societies and the more popular scientific journals. The present biography, however, is the most extensive one which has yet appeared and was written by a former assistant, who also lived in von Liebig's household. It treats of his work at the various institutions and his discussions with other famous scientists, and includes excerpts from his writings on pure, agricultural, and fermentation chemistry, physiology, and nutrition.

Handbook of methods in inorganic chemistry, edited by A. STÄHLER (*Handbuch der Arbeitsmethoden in der anorganischen Chemie. Leipsic, 1913, vol. 1, pp. XII+787, figs. 1064*).—This is the first volume of an extensive handbook on inorganic chemical methods. It deals with the construction and equipment of laboratories and the mechanical operations of inorganic chemistry, and is plentifully illustrated.

The practical methods of organic chemistry, L. GATTERMANN, trans. by W. B. SCHÖBER and V. S. BABASINIAN (*New York, 1914, 3. ed., pp. XVII+401, figs. 95*).—This edition, translated by V. S. Babasianian, is divided into a general and special part, as well as a section on inorganic chemistry.

The general part deals with crystallization, sublimation, distillation, decolorizing, drying, melting points, and the following organic analytical methods: Detection of carbon, hydrogen, nitrogen, sulphur, and the halogens; quantitative determination of the halogens and of sulphur (Carius method), nitrogen (Dumas method), and carbon and hydrogen (Liebig method); and elementary analysis (Dennstedt method). The special part deals with the aliphatic series, transition from the aliphatic to the aromatic series, and the aromatic, pyridin, and quinolin series.

Progress made in the chemistry of foods and condiments during the year 1912, H. KUTTENKEULER (*Chem. Ztg., 37 (1913), Nos. 103, pp. 1033-1035; 106, pp. 1058-1060; 108, pp. 1075, 1076; 109, pp. 1087, 1088*).—This is the usual report (*E. S. R., 29, p. 412*), and deals with the food laws and regulations, general chemistry of foods, methods for examining foods and condiments, food preservatives, meat and meat goods, eggs and egg conserves, vegetables and vegetable conserves, vinegar and spices, honey, sugar and sugar products, fruits and fruit juices, and beverages.

Starch sugar, H. WICHELHAUS (*Der Stärkezucker. Leipsic, 1913, pp. VIII+232, figs. 57*).—This work deals with the subject from both a chemical and a technical standpoint, taking up the history of starch sugar, theoretical considerations, properties of glucose, investigations in regard to starch and its hydrolysis, technical preparation of starch sugar, obtaining glucose from cellulose; concentration of juices containing saccharin matter, the crystallization method, utilization of starch sugar, and methods for determining starch and starch sugar.

Presence of reducing sugars in the fresh beet root: Influence of reducing sugars on the direct determination of sucrose in the beet root.—Origin of the reducing sugars that certain beet sugar factory products contain, H. PELLET (*Bul. Assoc. Chim. Sucr. et Distill.*, 3 (1912), No. 5, pp. 239–253; *abs. in Jour. Soc. Chem. Indus.*, 32 (1913), No. 1, pp. 38, 39).—Experiments with roots grown in France which were in full vegetation in November and which had been pulled and pressed in from half an hour to an hour have shown that reducing sugars are always present in the ripe root, though in small and variable amount, the extreme differences found in good roots of high sucrose content being from 0.05 to 0.27 gm. per 100 cc. of expressed juice. For low-quality roots, likewise freshly picked, the reducing sugars may be as high as from 2 to 2.5 gm. In the case of sound roots preserved in silos, either in full contact with air or covered with earth, the sucrose content gradually diminishes, but the reducing sugars generally remain within the limits of 0.15 and 0.25 gm. For injured or altered roots the reducing sugar content may rise to 0.5 gm.

In determining small amounts of reducing sugars in the beet, certain precautions must be taken, the most important of them being to use for defecation only normal lead acetate solution, otherwise a certain amount of the reducing sugars, principally levulose, will be precipitated.

As to the formation of reducing sugars during the process of manufacture, the author states that with the modern method of sulphiting traces of reducing sugars are formed and accumulate in the final molasses. This, it is stated, often contains as much as from 0.3 to 0.5 per cent, even with careful working.

The acid content of fruits, P. B. DUNBAR and W. D. BIGELOW (*Abs. in Science*, n. ser., 38 (1913), No. 983, pp. 639, 640).—In this study the characteristic acids of a large number of common fruits were identified and determined.

“The acidity of plums, apples, and cherries appears to be due entirely to malic acid which is probably present, for the most part, in the free state. Currants always contain citric acid, and may or may not contain malic acid. Gooseberries contain large amounts of both malic and citric acids. In persimmons and bananas malic acid probably occurs alone. The pomegranate and cantaloup contain citric acid, probably without malic acid. In the watermelon, quince, and peach malic acid predominates, and citric acid is probably absent. Cranberries contain both malic and citric acid. Red raspberries contain citric acid, with malic acid present in traces, if at all. Blackberries contain citric acid in some cases, while some samples contain traces of malic acid without citric and in others neither malic nor citric acid could be identified. The acid of the apricot has not been positively identified. There is present some dextrorotatory acid whose rotation is increased by the addition of uranyl acetate—possibly tartaric or dextromalic acid. The acid of the huckleberry has not been positively identified. Traces of malic acid without citric appear to be present. Tartaric acid was not found in any of the fruits examined, with the possible exception of apricots. In the case of pears, Kieffer, Le Conte, Idaho, and Bartlett contain little or no malic, while citric acid appears to predominate. In all other varieties the acidity appears to be due mostly or entirely to malic acid.

“The paper also includes a review of the literature on the acidity of fruits, with the results of various writers presented in tabular form.”

Changes taking place in grass during the process of curing, F. FLEISCHMANN (*Landw. Vers. Stat.*, 76 (1912), No. 3–6, pp. 237–447, figs. 4; *abs. in Chem. Zentbl.*, 1912, I, No. 26, pp. 2058–2060).—Marked changes were found to take place in grass even when cured under favorable conditions, consequently it is believed incorrect to consider hay (Dürrheu) as a green feed which contains

a smaller amount of water than grass. The changes taking place were as follows:

(1) Dry substance: On drying the grass slowly losses in dry substance were noted, the losses increasing with the temperature and the time of drying, but drying in strong sunlight at times caused a slight increase in dry substance. If fresh or wilting grass becomes wet, losses are sustained which are due to the vital activity of the plant cells. In wilted grass, and still more with hay, micro-organisms also produce losses in total solids, but these are much lower than those produced by the above-mentioned factors. The lowest amount of loss is due to leaching. (2) Phosphorus compounds: Lecithin is destroyed when the wilted plant is undergoing blanching or when conditions prevail which are favorable to bacterial action. (3) Phosphoproteins: These were decomposed up to an extent of 87 per cent of the total present in the dry substance. (4) Nitrogenous compounds: No loss in nitrogen was observed. Protein was decomposed by slow heating to the extent of 10 to 50 per cent, due to the vital activity of the cells.

Losses were noted in crude fat, but none in crude ash. Nitrogen-free extractive substances were lost in all the curing tests. The saccharose-like substances were lost in every case, the dextrin in most cases, and starch only when the heating was prolonged. The total loss in water-soluble substances was small.

The methods used for determining the substances above mentioned are described in much detail in the original.

Some closer investigations on the micro-organisms found in fermenting tea, W. STAUB and J. J. B. DEUSS (*Dept. Landb., Nijv. en Handel [Dutch East Indies], Meded. Proefstat. Thee, No. 18 (1912), pp. 19*).—Yeast and bacteria have no manifest effect upon the fermentation of tea unless a long-continued abnormal fermentation is present. Pure cultures of yeast added during the process of tea manufacture have no noticeable effect upon the aroma. Moldy tea leaves or those containing much yeast and bacteria become brownish black and have a tendency to rot. The tannic acid of tea liquors may be converted gradually into gallic acid through the agency of the micro-organism and as a result the tea infusion takes on characteristics which are specific.

Two kinds of bacteria were isolated from normal and abnormally (deferred) fermented tea. They are termed tea organisms I and II and both have marked slime-forming properties. They are probably the cause of the sliminess which occurs when tea ferments for a long time.

Respiration, decay, self-heating, and chemical composition of potatoes under different conditions, W. HENNEBERG (*Ztschr. Spiritusindus., 1912, Ergänzungsh. 2, pp. 15–33, figs. 4; abs. in Chem. Abs., 7 (1913), No. 13, p. 2261*).—The amount of sugar present in stored potatoes seems to vary directly with the carbon dioxid content, and this in turn with the temperature of the room in which they are stored. Potatoes having a very high sugar content decay the easiest, so that by keeping the temperature of storage low there is less spoilage.

Studies of the chemical composition of cotton seed, C. L. HARE (*Science, n. ser., 39 (1914), No. 1001, p. 363*).—"A record of work at the Alabama Experiment Station which was undertaken in order to ascertain whether it would be possible by breeding cotton to improve the seed in the direction of a larger oil content and higher protein content, though, of course, without prejudice to the amount and quality of the fiber, but up to the present little definite progress has been made. Apparently there is no relation between the amount of lint and that of oil or protein, but the amount of oil seems to bear some relation to the weight of the seeds, to the percentage of protein, and, possibly, to the amount of inorganic constituents."

The structure of the soy bean, T. E. WALLIS (*Pharm. Jour. [London]*, 4. ser., 37 (1913), No. 2597, pp. 120-123, figs. 7).—A description, with illustrations, of the microscopical anatomy of the soy bean.

About the presence of nitrogen-containing substances in the germinating seeds of *Vicia faba*, T. TORQUATI (*Arch. Farmacol. Sper. e Sci. Aff.*, 15 (1913), No. 5, pp. 213-223; abs. in *Chem. Ztg.*, 37 (1913), No. 45, p. 456).—From an aqueous extract of the horse bean (*V. faba*) with lead subacetate a crystalline substance was obtained which yielded with ferric chlorid an emerald-green solution. In a slightly alkaline solution the coloration obtained was violet. The substance was almost insoluble in cold water and in the usual organic solvents, but at 40 to 45° C. it was soluble in both water and alcohol. It had a reducing action, and when exposed to air or oxidizing substances was unstable. Lassaigne's reaction showed the substance to be of a nitrogenous nature, and from the elementary analysis the formula $C_{11}H_{16}NO_5$ could be assigned to it.

Denitrification as a result of enzym action, W. HULME (*Abs. in Chem. Ztg.*, 37 (1913), No. 73, p. 738).—The tests were conducted in bouillon and fluorescent denitrifying organisms. The results seem to indicate that the denitrification process is due to enzymes.

Studies on the specific nature of the intracellular enzymes by means of the optical method, I, E. ABDERHALDEN and A. FODOR (*Hoppe-Seyler's Ztschr. Physiol. Chem.*, 87 (1913), No. 3, pp. 220-224; abs. in *Jour. Chem. Soc. [London]*, 104 (1913), No. 612, I, p. 1118).—Juices of various tissues deprived of blood were tested against the peptone obtained from the same tissues. Liver juice hydrolyzed liver peptone but had no action on kidney or thyroid peptone. Kidney juice hydrolyzed both kidney and liver peptones and in one out of three cases acted upon thyroid peptone. Thyroid juice hydrolyzed only thyroid peptone.

Specific nature of the intracellular enzymes studied by means of the optical method, II, E. ABDERHALDEN and E. SCHIFF (*Hoppe-Seyler's Ztschr. Physiol. Chem.*, 87 (1913), No. 3, pp. 231, 232; abs. in *Jour. Chem. Soc. [London]*, 104 (1913), No. 612, I, p. 1118).—The enzymes of the muscle juice of the horse were found to hydrolyze muscle peptone but not liver or brain peptone. The enzymes of the testicle and kidney hydrolyze testicle peptone, while brain peptone is hydrolyzed only by brain and kidney juices.

The speed with which protective enzymes appear after the repeated injection of the foreign substratum, I, E. ABDERHALDEN and E. SCHIFF (*Hoppe-Seyler's Ztschr. Physiol. Chem.*, 87 (1913), No. 3, pp. 225-230; abs. in *Jour. Chem. Soc. [London]*, 104 (1913), No. 612, I, pp. 1117, 1118).—While it takes some time for protective enzymes to appear after the intravenous injection of a foreign peptone into the blood stream, the ferments appear in a very much shorter time if a second injection is made after the serum has become inactive.

The experiments were made with silk and gelatin peptones.

A study of the methods of estimation of carbohydrates, especially in plant extracts.—A new method for the estimation of maltose in presence of other sugars, W. A. DAVIS and A. J. DAISH (*Jour. Agr. Sci. [England]*, 5 (1913), No. 4, pp. 437-468, figs. 2).—In the estimation of mixed sugars in plant extracts, the most satisfactory procedure was the gravimetric method, following the specifications of Brown, Morris, and Millar and using the tables prepared by them.

The tables were tested for their accuracy by means of carefully purified specimens of dextrose, levulose, cane sugar, and maltose. "Large errors in the gravimetric method may be obtained unless special care is taken in purifying the asbestos by boiling for at least 30 minutes with 20 per cent sodium

hydroxid." From the results "it is clear that there is present in the asbestos, as an impurity, some easily decomposable silicate which is gradually dissolved away by the strongly alkaline Fehling solution." "Weighing the reduced copper as cuprous oxid is likely to give rise to large error [if used for substances like plant extracts], and a process of weighing as cupric oxid, with certain precautions, is recommended."

For heating the saccharin solution and Fehling's solution a special form of bath was devised which is illustrated.

The results of an extended study of the Ling-Rendle-Jones and Bertrand methods show that the methods are at best approximate, but preference is to be given to the former. For inverting cane sugar in the estimation of sugars in plant substances it was found advisable to use either invertase or a weak acid such as citric or oxalic. "In dealing with plant extracts [clarified with basic lead acetate], owing to the accumulation of sodium acetate in the solutions analyzed, inversion by citric acid of lower concentration than 10 per cent is generally incomplete. Inversion by invertase is, however, not interfered with by this salt. To estimate cane sugar inversion both by invertase and 10 per cent citric acid is recommended. No loss of sugars occurs owing to the use of basic lead acetate as has been sometimes stated; the supposed loss is probably due to incomplete inversion caused by the presence of sodium acetate. It is shown by a detailed study of the action of dilute hydrochloric acid on different sugars that it is impossible to completely hydrolyze maltose at either 70 or 100° C. without simultaneously destroying large quantities of levulose or dextrose." Minute details of the invertase method are given.

While it has been frequently proposed to estimate maltose by hydrolysis with dilute hydrochloric or sulphuric acid at 100°, noting the change of cupric reduction power or specific rotation after allowing for the inversion of cane sugar present, the method often, when carefully regulated, will give only approximate results. It is inapplicable in all cases where cane sugar and levulose, or pentoses, are present in solutions prepared from plant extracts. Under the conditions recommended by Brown and Morris the levulose is destroyed very early in the process. "With both cane sugar and levulose a considerable decomposition was made evident by the production of much brown, humus-like material." "The only available method for the accurate estimation of maltose consists in the employment of special maltase-free yeasts, such as *Saccharomyces exiguus*, *S. marxianus*, or *S. anomalus*, introducing a correction (for pentoses, etc.) obtained by a special fermentation with baker's or brewer's yeast.

"A scheme for the quantitative estimation of sugars in plant material is given."

An easily conductible procedure for the quantitative determination of pentoses in the presence of other sugars with the aid of the spectroscope, E. PINOFF and K. GUDE (*Chem. Ztg.*, 37 (1913), No. 61, p. 621).—The pentose content of a sugar solution can be determined according to the following method:

Twenty-five cc. of the aqueous solution, containing not more than 3 per cent of pentose, is placed in a 150 to 200 cc. Erlenmeyer flask holding a cork stopper provided with a 1-meter glass tube, or instead, a small reflux condenser. Then 25 cc. of hydrochloric acid, specific gravity 1.19, 50 cc. of 96 per cent alcohol, and 0.6 gm. of phloroglucin are added. The mixture is heated from the time the alcohol begins to boil for exactly one-half hour and the flask with its contents is then quickly cooled. Twenty cc. of the solution is run into a Hehner colorimeter with a pipette and alcohol is added until the tube when

held before the spectroscope will just show the presence of two absorption bands.

By multiplying by 0.0948 the degree of dilution (i. e., the figure which shows how many times the pentose-containing solution after treatment is diluted with alcohol) plus 1, the percentage of pentose added in the original solution can be ascertained. Dextrose, levulose, and cane sugar when present have no effect upon the results.

Amylometer, a new apparatus for calculating the starch content of potatoes, W. VILIKOVSKÝ and G. STEMPEL (*Ztschr. Landw. Versuchsw. Österr.*, 16 (1913), No. 9, pp. 893-898, figs. 2).—A description of the apparatus with which it is possible to determine the starch content of potatoes with small samples. The Maercker, Behrend, Toth, and similar methods require very large quantities of potatoes for a determination.

Estimation of copper in conserves with the spectrophotometer, E. TASSILLY (*Bul. Soc. Chim. France*, 4. ser., 13 (1913), No. 2, pp. 72-74; *abs. in Chem. Ztg.*, 37 (1913), No. 74, *Repert.*, p. 341).—From 10 to 15 gm. of the conserve under examination is dried upon a water bath, ignited, and then exposed to a moderate degree of heat. After digesting with from 2 to 5 cc. of sulphuric acid for three hours on a water bath, this is triturated from time to time, water added, filtered, and the residue washed on the filter with water. The copper in the filtrate is then precipitated with sodium hyposulphite, boiled, filtered, ignited in a porcelain crucible, subjected to a moderate heat, dissolved in the crucible with 1 to 1½ cc. of sulphuric acid and a few drops of nitric acid, and heated to remove the excess of sulphuric acid. The residue is then dissolved in water, and 2 cc. of a solution of potassium ferrocyanid which contains 0.07 gm. of potassium ferrocyanid in 1 cc. of water added, made up to 100 cc., and the copper determined spectrophotometrically. The results are compared with those obtained with a standard copper ferrocyanid solution of known strength.

Determination of copper in copper-spraying mixtures, P. MALVEZIN (*Ann. Chim. Analyt.*, 18 (1913), No. 6, p. 220; *abs. in Chem. Abs.*, 7 (1913), No. 19, pp. 3382, 3383).—The method depends on the action of methanal sulphurous acid ($\text{CH}_2\text{OH}\cdot\text{SO}_3\text{H}$) on an ammoniacal copper solution. The reagent is made by saturating a 40 per cent solution of formaldehyde with sulphur dioxide. The titer of the resulting solution is then determined with a 1 per cent solution of metallic copper in an aqueous nitric acid solution. One cc. of this solution is mixed in a test tube with 2 cc. of ammonium hydroxid and 1 cc. of water and the reagent added until the solution becomes colorless.

In order to determine the quantity of copper in a spray "weigh out 1 gm., ignite carefully in a porcelain crucible, and dissolve in nitric acid; dilute in a graduate to 20 cc. with water, filter, transfer 10 cc. to a large test tube, add 2 cc. ammonium hydroxid, and dilute with water to 20 cc. Filter, and to 10 cc. of the filtrate add 1 cc. of ammonium hydroxid and titrate as above. The method is said to be rapid and exact, being designed for the use of pharmacists in preparing sprays for viticulturists.

General method for the analysis of the ashes of body fluids, W. MESTREZAT (*Jour. Pharm. et Chim.*, 7. ser., 7 (1913), No. 2, pp. 60-65; *abs. in Jour. Chem. Soc. [London]*, 104 (1913), No. 605, II, p. 244).—A description of a general method whereby phosphoric acid, iron, aluminum, lime, and magnesium can be determined in the same sample of ash from a body fluid. Sodium and potassium are estimated in a separate sample of ash.

A new method for determining lactic acid in organic substances, A. BELLET (*Compt. Rend. Soc. Biol. [Paris]*, 74 (1913), No. 15, pp. 900-902, fig. 1; *abs. in Chem. Ztg.*, 37 (1913), No. 72, p. 725).—In this method the lactic acid is con-

verted into aldehyde with potassium permanganate in a solution containing sulphuric acid. After the reduction of a sodium-silver solution by the aldehyde, the excess of silver is determined. The equation representing the process is $\text{Ag}_2\text{O} + \text{CH}_3\text{CHOH.CO}_2\text{H} = \text{Ag}_2 + \text{CH}_3\text{CHO} + \text{CO}_2 + \text{H}_2\text{O}$.

Estimation of formic acid, T. TORQUATI (*Rend. Soc. Chim. Ital.*, 2. ser., 4 (1912), No. 11, pp. 307, 308; *abs. in Chem. Ztg.*, 37 (1913), No. 45, p. 456).—This depends upon the reduction of mercuric to mercurous chlorid. The amount of precipitated calomel corresponds to the formic acid present.

Estimation of nitric acid, T. TORQUATI (*Rend. Soc. Chim. Ital.*, 2. ser., 4 (1912), No. 11, pp. 308–310; *abs. in Chem. Ztg.*, 37 (1913), No. 45, p. 456).—The method described is based upon the reduction of the nitric acid to nitrous oxid by formic acid.

Detection of nitrous acid when present with ferric salts, P. ARTMANN (*Chem. Ztg.*, 37 (1913), No. 49, p. 501).—The reaction is conducted as follows:

In 100 cc. of water dissolve 8 gm. of pure disodium phosphate and add about 0.2 gm. of potassium iodid; shake until the phosphate is dissolved and only a white turbidity remains. Then acidify with 5 cc. of 4 times normal hydrochloric acid solution and add 2 cc. of starch solution (zinc iodid starch was found to serve well for this purpose). If 0.3 mg. or thereabouts of N_2O_3 is present a blue coloration is obtained. If large amounts of ferric salts are present, the reaction is accelerated. By this means as little as 0.1 to 0.2 mg. of N_2O_3 when present with ferric salts to the extent of 500 mg. to the liter can be detected.

The detection of nitrates and nitrites in sewage, A. HIGGINSON (*Chem. News*, 106 (1912), No. 2769, p. 306; *abs. in Chem. Ztg.*, 37 (1913), No. 47, p. 480).—The nitrates in sewage can easily be converted into ammonia with a copper zinc electrode contained in a solution of sodium hydroxid. The solution is then distilled and the ammonia determined in the distillate. If too small amounts of sodium hydroxid are used, the ammonia only passes over into the distillate when the solution has been concentrated to a very small volume.

The results obtained compare well with those given by the phenolsulphonic acid method.

A method for determining phosphoric acid, L. MOESER and G. FRANK (*Ztschr. Analyt. Chem.*, 52 (1913), No. 6, pp. 346–349; *abs. in Chem. Ztg.*, 37 (1913), No. 74, *Repert.*, p. 337).—From 0.3 to 0.5 gm. of the mineral under examination is treated with 4 to 6 cc. of concentrated sulphuric acid and heated to the boiling point on a sand bath for 10 to 50 minutes. After cooling, 30 to 40 cc. of 95 per cent alcohol and 2 cc. of a 10 per cent alcoholic potassium hydroxid solution are added, shaken, cooled, filtered, and the precipitate washed with alcohol. All of the bases remain on the filter, while the phosphoric acid is contained quantitatively in the filtrate, which after dilution with an equal volume of water is rendered slightly alkaline with ammonia and the phosphoric acid precipitated with magnesia mixture. The phosphoric acid is weighed as magnesium pyrophosphate.

Citro-phosphate solutions.—I, The homogeneous equilibrium in aqueous solution as studied by the cryoscopic method, U. PRATOLONGO (*Atti R. Accad. Lincei, Rend. Cl. Sci. Fis., Mat. e Nat.*, 5. ser., 20 (1911), I, No. 11, pp. 812–818; *abs. in Jour. Soc. Chem. Indus.*, 31 (1912), No. 4, p. 195).—A study on the nature of solutions of calcium phosphates in citric acid and ammonium citrate, which deals especially with the cryoscopic value of solutions of citric acid, of mono-, di-, and tricalcium phosphates in citric acid, of diammonium citrate, and of mono- and dicalcium phosphates in diammonium citrate. The results obtained were at variance with those found by Herzfeld and Feuerlein,^a Barillé (E. S. R.,

^a *Ztschr. Analyt. Chem.*, 20 (1881), pp. 191–208.

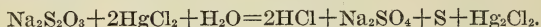
20, p. 610), and Quartaroli,^a that complex ions are formed by the citric and phosphoric acids, but can be brought into satisfactory accord with the ideal that double decomposition takes place, as shown by Grupe and Tollens,^b and Zulkowski and Cedivoda (E. S. R., 14, p. 939). The differences between the observed and calculated results in the cryoscopic determinations are regarded as due to varying hydrolytic dissociation of the reaction products.

The preparation of Petermann's solution, F. ZÖHREN (*Chem. Ztg.*, 37 (1913), No. 60, pp. 611, 612, fig. 1).—The preparation of ammonium citrate solution from ammonia and citric acid is often disagreeable on account of the ammonia which is given off during the course of its preparation. The loss of this ammonia obviously also causes some differences in the titer of the solution. The author therefore proposes the use of an apparatus which consists of an Erlenmeyer flask with a side neck and provided with a stirring device. To the side neck is attached a wash bottle which contains some citric acid. This citric acid absorbs the ammonia which is driven off and may be added later to the main solution.

The solubility of basic slag, J. HUGHES (*Chem. News*, 107 (1913), No. 2774, p. 39; *abs. in Chem. Ztg.*, 37 (1913), No. 59, *Repert.*, p. 267).—The presence of from 2 to 3 per cent of free lime in Thomas slag seems to influence favorably the solubility of the slag in a 2 per cent citric acid solution. Below this limit the solution dissolves relatively less phosphoric acid and more calcium oxid.

Method for the titration of sulphurous acid and sulphurous acid in the presence of thiosulphuric acid, E. BOSSHARD and W. GROB (*Chem. Ztg.*, 37 (1913), No. 46, pp. 465, 466; *abs. in Jour. Soc. Chem. Indus.*, 32 (1913), No. 10, p. 532).—A mixture of sulphite and bisulphite is first titrated with hydrochloric acid, using methyl orange as indicator. A saturated solution of mercuric chlorid and some pure sodium chlorid are added, and the solution is titrated with sodium hydroxid, using the same indicator. The normal sulphite present is found by the first titration, and the alkali corresponding to the original bisulphite by subtracting from the total required that neutralized by the bisulphite formed in titrating with acid. If thiosulphate is also present the sulphurous acid may be determined by titration with hydrochloric acid, using methyl orange as the indicator, and the bisulphite produced is then estimated together with that originally present by titration with fifth-normal sodium hydroxid solution against phenolphthalein.

The thiosulphate is determined in another portion of the solution by adding an excess of mercuric chlorid, 1 gm. of pure sodium chlorid, and 30 cc. of fourth-normal ammonium chlorid solution, and titrating with an alkaline solution. The amount of thiosulphate is calculated after subtracting the alkali used for the bisulphate by the following equation:



The determination of calcium as a tungstate, A. SAINT-SERNIN (*Compt. Rend. Acad. Sci. [Paris]*, 156 (1913), No. 13, pp. 1019, 1020; *abs. in Chem. Ztg.*, 37 (1913), No. 51, p. 525).—This method, which is especially adapted to the analysis of hydraulic limes and cements, depends upon the precipitation of the calcium with a solution of sodium tungstate. A crystalline precipitate consisting of calcium tungstate is rapidly obtained which can be weighed after drying. The results are calculated to calcium or calcium oxid.

The industrial synthesis of sodium cyanid, C. MATIGNON (*Rev. Gén. Sci.*, 24 (1913), No. 23, pp. 882–886, figs. 3; *Sci. Amer. Sup.*, 77 (1914), No. 1991, pp.

^a Staz. Sper. Agr. Ital., 43 (1910), No. 7–9, pp. 545–558.

^b Ber. Deut. Chem. Gesell., 13 (1880), pp. 1267–1270.

134, 135, figs. 3).—This describes the methods of synthesizing sodium cyanid by the older and newer methods. This substance is being introduced in metallurgical work, and it is predicted will eventually find much use as a substitute for potassium cyanid for fumigation purposes in agriculture.

Winery directions, F. T. BIOLETTI (*California Sta. Circ.* 119 (1914), pp. 8).—This circular gives directions for the use of pure yeasts and also for fermenting dry red wine and dry white wine. In addition tabular data are included relating to average yields, temperature corrections for the Balling saccharometer, the Balling degree and sugar of must and alcohol of wine (based on California analyses), and notes on wine fermentation.

Manufacture of dried vegetables, fruits, etc., V. VALVASSORI (*Bul. R. Soc. Toscana Ort.*, 3. ser., 17 (1912), No. 8, pp. 207-211, fig. 1).—This deals with methods for drying fruits and vegetables, and the time required. An illustration is given of the drying apparatus used. The product is termed "Julienne" in Italy. The cost of manufacture is also considered.

Experiments in the desiccation of wild berries, G. LIND (*K. Landtbr. Akad. Handl. och Tidskr.*, 52 (1913), No. 3, pp. 172-191, figs. 11).—Tests were made in 1912 with blueberries and Scandinavian cranberries (*Vaccinium oxycoccus*). The methods and apparatus used in collecting and drying them are described, and the apparatus is illustrated. The author is of the opinion that this method of utilizing wild berries will prove to be of great economic importance to Denmark.

Production of dextrin and its use, E. PAROW (*Ztschr. Spiritusindus.*, 35 (1912), Nos. 38, pp. 507, 508; 39, p. 519; abs. in *Jour. Soc. Chem. Indus.*, 31 (1912), No. 20, pp. 1001, 1002).—A discussion of the classes of material made from potato, maize, and cassava starch, the methods of manufacture, the composition of the commercial product, and the amount of production in Germany, Great Britain, and the United States.

A new agricultural industry: Sugar from millet, P. H. CHEVALIER (*Bol. Min. Agr., Indus. e Com. [Brasil]*, 2 (1913), No. 4, pp. 171-173).—This discusses the possibility of obtaining sugar, alcohol, feed cakes, and cellulose from millet stalks. A comparison is made with the corn plant.

METEOROLOGY.

Agricultural meteorology and wireless telegraphy, L. M. GRANDERYE (*Vie Agr. et Rurale*, 3 (1914), No. 23, pp. 628-630, figs. 4).—Recent applications of wireless telegraphy in the dissemination of weather forecasts by the meteorological service of France are described and details of the apparatus and methods used are given.

Analysis of very small quantities of gas as applied to the examination of air, P. A. GUYE and F. E. E. GERMANN (*Compt. Rend. Acad. Sci. [Paris]*, 159 (1914), No. 2, pp. 154-157, fig. 1).—A special form of pressure apparatus for this purpose is described.

The meteorological aspect of the smoke problem, H. H. KIMBALL (*Mellon Inst. Indus. Research, Smoke Invest. Bul.* 5 (1913), pp. 51, figs. 4).—This is a report on a study of this question in Pittsburgh and surrounding districts.

The results show that in the business section of Pittsburgh the limit of visibility is about one-tenth the limit in the open country, and that the chemical intensity of the sunlight is about 25 per cent less. The effect of the smoke upon temperature is to raise the minimum temperature materially, especially during the warm months of the year.

The observations made in Pittsburgh and surrounding districts confirm those made elsewhere.

The shifting of the climatic belts, A. PENCK (*Scot. Geogr. Mag.*, 30 (1914), No. 6, pp. 281-293, fig. 1; rev. in *Nature* [London], 93 (1914), No. 2334, p. 532).—"The main line of the author's argument is that certain lakes—e. g., Lake Chad in the Sahara, the lakes of Mexico City, and the Titicaca basin—being very slightly salt, indicate an increasing precipitation, and during the so-called 'pluvial period' were drier than at present, owing to a shifting of the arid belt equatorwards."

Climatic change, C. E. P. BROOKS (*Nature* [London], 93 (1914), No. 2334, p. 532).—The author takes exception to the conclusion reached by Penck in the article noted above. He takes the position that saltiness of the inland lakes referred to indicates a decrease rather than an increase of precipitation.

Climatological data for the United States by sections (*U. S. Dept. Agr., Weather Bur. Climat. Data*, 1 (1914), Nos. 7, pp. 228, pls. 2, figs. 7; 8, pp. 226, pls. 2, figs. 7).—These numbers contain brief summaries and detailed tabular statements of climatological data for each State for July and August, 1914, respectively.

General weather review for the locality of Storrs, Connecticut, 1912 and 1913, W. M. ESTEN and C. J. MASON (*Connecticut Storrs Sta. Bul.* 79 (1914), pp. 395-410, figs. 3).—The temperature and rainfall are summarized for each month and tables are given which show the monthly and annual means of temperature and precipitation for 25 years, 1888 to 1912, and the length of the growing season for 26 years, 1888 to 1913.

The mean temperature for 25 years was 47.2° F.; highest temperature, 99°, July 3, 1911; lowest temperature, -14°, February 7, 1910; mean rainfall, 44.65 in.; longest duration of growing season 184 days, April 18 to October 19, 1901; average date of last killing frost in spring, May 4; average date of first killing frost in autumn, October 9; prevailing wind January, February, March, April, May, August, October, November, and December, northwest; June, July, September, southwest; for the year, northwest.

Meteorological observations at the Massachusetts Agricultural Experiment Station, J. E. OSTRANDER and R. E. McLAIN (*Massachusetts Sta. Met. Buls.* 309, 310 (1914), pp. 4 each).—Summaries of observations at Amherst, Mass., on pressure, temperature, humidity, precipitation, wind, sunshine, cloudiness, and casual phenomena during September and October, 1914, are presented. The data are briefly discussed in general notes on the weather of each month.

The climate of New York in relation to agriculture, W. M. WILSON (*Cornell Countryman*, 12 (1914), No. 2, pp. 100-108, figs. 8).—This article distinguishes between weather and climate and enumerates the factors which control climate. New York is divided into ten climatic divisions and the temperature of each of these divisions is discussed with reference to the effect of water, land, and elevation. Similarly the rainfall is considered with reference to elevation and prevailing winds. The distribution of temperature and rainfall is shown in maps and diagrams.

The climate and weather of Australia, H. A. HUNT, G. TAYLOR, and E. T. QUAYLE (*Melbourne: Commonwealth Bur. of Met.*, 1913, pp. 93, pls. 39, figs. 10; abs. in *Bul. Amer. Geogr. Soc.*, 46 (1914), No. 11, p. 849).—Climatic and weather data for this country are summarized in detail. The mean climatic conditions are carefully charted and explained and the characteristic weather conditions which make up the climate are clearly and fully presented.

The highest temperatures are recorded over the northwestern portion of Western Australia, where the maximum shade temperatures have exceeded 100° F. on 64 consecutive days and 90° on 150 consecutive days, the mean temperature of the hottest month being 90° and the mean temperature of the coldest being 65°.

"The coldest portion of Australia is the Australian Alps, situated in north-eastern Victoria and southeastern New South Wales, where the mean shade temperatures range from 65° in January to 40° F. in July. During exceptionally dry summers the temperatures in the interior reach and occasionally exceed 120°, and the same areas during the winter months are subject to ground frosts.

"Taking Australia as a whole, the extremes of temperature annually, seasonally, and daily are less than those experienced in any of the other continents, and the mean temperatures prevailing are generally lower than for corresponding latitudes in the other continental land areas of the globe. These features are due mainly to insularity and the comparative absence of physiological extremes. . . .

"Brisbane experiences the highest annual mean maximum temperature with 78°; Adelaide and Perth follow with 73°; Sydney, 70°; Melbourne, 67°; and Hobart, 62°. But the extremes take a different order. Adelaide comes first with a maximum of 116°; Melbourne, 111°; Brisbane, 109°; Sydney and Perth, 108°; and Hobart, 105°.

"The lowest shade temperatures recorded are as follows: Melbourne, 27°; Hobart, 27°; Adelaide, 32°; Perth, 35°; Sydney and Brisbane, 36°. . . .

"Australia and Tasmania cover 2,974,581 square miles. Of this total area 1,045,073 square miles have less than 10 in. [of rainfall] per annum on the average; 651,961 square miles have from 10 to 15 in.; 416,135 from 15 to 20 in.; 502,929 square miles from 20 to 30 in.; 198,608 square miles from 30 to 40 in.; and 159,875 square miles have an annual average rainfall of over 40 in."

Ocean currents and topography as controlling factors of climate are discussed.

The distribution of rainfall in the northeastern United States: Its causes and results, B. C. WALLIS (*Scot. Geogr. Mag.*, 30 (1914), No. 11, pp. 582-595, figs. 4; *abs. in Nature* [London], 94 (1914), No. 2352, p. 345).—The area included in this study is the triangle roughly bounded by the Atlantic coast, the line of the St. Lawrence and the Great Lakes, and a line stretching across country from the southeast corner of Lake Michigan to the coast of North Carolina. Details of rainfall distribution are presented in text, tables, and diagrams, and the distribution is compared with that under similar conditions in England. The varying relations of crop production to rainfall in the two countries are also discussed.

The maps and diagrams show by means of "equipluves," or lines of equal average rainfall coefficients or percentages, the areas and dates of the wettest and driest months, and consequently the districts where the principal crops (corn, cotton, and tobacco) can best be grown.

"In both districts the oceanic side of the uplands is absolutely wetter than the land beyond the hills, but Britain is warmer in winter, cooler in summer, suffers less variation in actual temperatures, has much less precipitation in the form of snow, and has a much shorter period of permanent frost. In Britain the prevailing wind is from the ocean, and in America the prevailing wind is a land wind. Consequently in Britain the relatively less elevated uplands are the predominant factor, both as regards the total annual precipitation and as

regards the distribution of the rainfall throughout the year, while in America the rainfall is chiefly governed by the changes which occur in actual temperature.

"At the same time in America the temperature changes render the farmer more or less independent of the rainfall, while in England the rainfall largely determines the nature of the crops which the farmer produces. In England wheat is not grown well where the annual rainfall exceeds 30 in., yet the greatest attention is paid to wheat in northeastern America where the rainfall is at least 40 in. per annum. In England cotton and tobacco are not considered by the farmer as possible crops; in America in an area which is at least as cold as Lancashire during the winter the great warmth of the summer makes both these crops valuable to the farmer."

The rainfall of California, A. G. MCADIE (*Univ. Cal. Pubs., Geogr.*, 1 (1914), No. 4, pp. 127-240, pls. 8, figs. 12; *abs. in Nature* [London], 94 (1914), No. 2346, p. 184).—Detailed data drawn chiefly from records of the United States Weather Bureau and extending in some localities over a period of 63 years are summarized and discussed in this report.

Among the chief factors controlling the rainfall of the State considered in the report are the diversified topography, the prevalent westerly winds from the Pacific Ocean, and the relatively cold California current. The State is divided into five climatic sections corresponding roughly with the principal watersheds, and for each is given the most prominent climatic features and a general statement of the distribution of rainfall and its variation with altitude. Detailed information is given in tables and plates. It is shown that summer in California is practically a rainless season. Certain parts of the State, however, are shown to lie within the zone of maximum intensity of rainfall in the United States. For example, a maximum annual rainfall of 153.5 in. was recorded during the past 10 years in Del Norte County, and amounts exceeding 100 in. are recorded at many other places. Apparently the heaviest monthly rainfall in the United States (71.5 in.) occurred at Helen Mine, Cal., in January, 1909.

The rainfall of San Francisco is discussed in considerable detail. The annual mean for 64 years at this place is 22.6 in., the maximum annual rainfall 38.8 in., and the maximum 9.3 in. The longest drought recorded was 175 days in the summer half year of 1903.

Nitrogen in rain and snow, N. KNIGHT (*Proc. Iowa Acad. Sci.*, 20 (1913), pp. 189-191).—This article reports briefly a continuation of observations on the amount of nitrogen in rain and snow carried on in 1910 (*E. S. R.*, 30, p. 211). The methods used in the collection and examination of 14 samples of snow and 13 of rain, or rain and snow, are described and the results are tabulated without comment.

SOILS—FERTILIZERS.

The Rothamsted memoirs on agricultural science (*Harpenden, England*, 1914, vol. 8, pp. 528, pls. 7, figs. 101).—This, the eighth volume of these memoirs, contains all the scientific papers published from the Rothamsted Experimental Station during the years 1902-1912, except those on partial sterilization of the soil. These are to be included in the next volume. The subjects of the papers included are Wheat Grown Year After Year on the Same Land, by J. B. Lawes and J. H. Gilbert; The Mechanical Analysis of Soils and the Composition of

the Fractions Resulting Therefrom, by A. D. Hall; The Effect of Long-continued Use of Sodium Nitrate on the Constitution of the Soil, by A. D. Hall; The Analysis of the Soil by Means of the Plant, by A. D. Hall; Calcium Cyanamid, by A. D. Hall; On the Accumulation of Fertility by Land Allowed to Run Wild, by A. D. Hall; The Effect of Plant Growth and of Manures upon the Retention of Bases by the Soil, by A. D. Hall and N. H. J. Miller; The Amounts of Nitrogen as Ammonia and as Nitric Acid and of Chlorin in the Rain Water Collected at Rothamsted, by N. H. J. Miller; The Determination of Available Plant Food in Soil by the Use of Weak Acid Solvents, Part 2, by A. D. Hall and A. Amos; The Amount and Composition of the Drainage through Unmanured and Uncropped Land, by N. H. J. Miller; On the Function of Silica in the Nutrition of Cereals, Part 1, by A. D. Hall and C. G. T. Morison; The Interaction of Ammonium Salts and the Constituents of the Soil, by A. D. Hall and C. T. Gimingham; The Flocculation of Turbid Liquids by Salts, by A. D. Hall and C. G. T. Morison; Nitrification in Acid Soils, by A. D. Hall, N. H. J. Miller, and C. T. Gimingham; Direct Assimilation of Ammonium Salts by Plants, by H. B. Hutchinson and N. H. J. Miller; Some Secondary Actions of Manures upon the Soil, by A. D. Hall; The Development of the Grain of Wheat, by W. E. Brencley and A. D. Hall; The Influence of Copper Sulphate and Manganese Sulphate upon the Growth of Barley, by W. E. Brencley; On the Action of Certain Compounds of Zinc, Arsenic, and Boron on the Growth of Plants, by W. E. Brencley; The Direct Assimilation of Inorganic and Organic Forms of Nitrogen by Higher Plants, by H. B. Hutchinson and N. H. J. Miller; On the Absorption of Ammonia from the Atmosphere, by A. D. Hall and N. H. J. Miller; The Experimental Error of Field Trials, by W. B. Mercer and A. D. Hall; Soil Surveys and Soil Analyses, by A. D. Hall and E. J. Russell; On the Causes of the High Nutritive Value and Fertility of the Fattening Pastures of Romney Marsh and other Marshes in the Southeast of England, by A. D. Hall and E. J. Russell; The Development of the Grain of Barley, by W. E. Brencley; Experiments at Rothamsted on the Changes in the Composition of Mangels during Storage, I and II, by N. H. J. Miller; The Estimation of Carbon in Soils and Kindred Substances, by A. D. Hall, N. H. J. Miller, and Numa Marmu; Nitrogen and Carbon in Clays and Marls, by N. H. J. Miller; The Nitrogen Compounds of the Fundamental Rocks, by A. D. Hall and N. H. J. Miller; and A Note on Onion Couch, by L. M. Underwood.

Soil survey of Shawnee County, Kansas, R. I. THROCKMORTON, W. C. BYERS, ET AL. (*Kansas Sta. Bul.* 200 (1914), pp. 715-749, map 1).—This survey, made in cooperation with the Bureau of Soils of this Department, deals with the soil types, their mechanical and chemical composition and fertility requirements and crop adaptabilities of an area of 357,120 acres situated in north-eastern Kansas, which topographically is a high plateau frequently cut by valleys of varying size. The greater part of the drainage of the area flows into the Kansas River.

The soils of the county are divided broadly into upland soils of glacial and residual origin and bottom-land or alluvial soils. Eleven soil types are mapped, of which the Summit silty clay loam with two of its phases is the most extensive and important. The soils of the area are said to be deficient in available nitrogen and phosphorus and well stocked with potash. Calcium is higher in the bottom soils than in the upland soils. The amount of carbon in these soils is said to be closely related to the physical texture, the sandy soils containing less than the silty soils, and these in turn less than the silty clay soils.

The results of analyses of surface soils (to a depth of 7 in.) and subsoils (in most cases the layer between 20 and 30 or 40 in.) are given in the following table:

Average results of analyses of soil types of Shawnee County, Kansas.

Soil type.	Soil layer.	Nitrogen.	Phosphorus.	Potassium.	Calcium.	Organic carbon.	Inorganic carbon.
		<i>Per cent.</i>	<i>Per cent.</i>	<i>Per cent.</i>	<i>Per cent.</i>	<i>Per cent.</i>	<i>Per cent.</i>
Osage silt loam.....	Surface soil....	0.168	0.053	1.85	0.44	2.16	Trace.
	Subsoil.....	.116	.044	1.81	.75	1.10	Trace.
Osage silty clay loam.....	Surface soil....	.201	.061	2.06	.81	2.47	.....
	Subsoil.....	.030	.033	2.11	.78	1.29	.....
Osage very fine sandy loam.....	Surface soil....	.133	.044	1.96	.75	1.58	.....
	Subsoil.....	.059	.029	2.07	.82	.78	.....
Osage very fine sand.....	Surface soil....	.041	.022	2.06	.93	.26	0.067
	Subsoil.....	.033	.043	2.04	.99	.22	.107
Shelby loam.....	Surface soil....	.139	.027	1.50	.41	1.67	.....
	Subsoil.....	.055	.019	1.58	.52	.63	.....
Shelby loam, sandy phase.	Surface soil....	.195	.039	1.74	.54	2.47	Trace.
	Subsoil.....	.086	.036	1.73	.75	1.16	Trace.
Crawford silty clay loam...	Surface soil....	.255	.042	1.57	.39	2.73	.019
	Subsoil.....	.093	.036	1.60	.93	.70	.167
Oswego silt loam.....	Surface soil....	.212	.029	1.46	.53	2.77	.....
	Subsoil.....	.083	.036	1.63	.70	.86	.....
Summit silty clay loam...	Surface soil....	.275	.040	1.60	.54	3.38	.....
	Subsoil.....	.086	.021	1.70	.91	.85	.....
Boone fine sandy loam....	Surface soil....	.138	.039	1.10	.38	1.48	Trace.
	Subsoil.....	.085	.030	1.16	.42	.69	.013

The loess soils of southwestern Ohio, W. M. COOK, C. W. MONTGOMERY, ET AL. (*Ohio Sta. Circ. 146 (1914), pp. 20, figs. 15.*)—This circular, prepared in cooperation with the Office of Farm Management of this Department, briefly describes the loess soils occurring in Hamilton, Clermont, Brown, Adams, Highland, Clinton, and Warren counties in southwestern Ohio, and reports the results of observations on the methods employed by farmers for the improvement of their soils, especially the practice of drainage and the use of fertilizers and the results obtained therefrom.

The loess soils of this section occur as two distinct types, viz, the well-drained Cincinnati silt loam, yellowish brown in color, and the poorly-drained Clermont silt loam, which is light gray to white in color.

The observations indicate in general the effectiveness of proper drainage supplemented by systematic crop rotation and the intelligent use of manures and fertilizers in increasing the productiveness and agricultural value of these soils.

The ground water in Hamburg, A. VOLLER (*Jahrb. Hamburg. Wiss. Anst., 30 (1912), Beiheft 1, pp. 7, pls. 3.*)—The results of daily measurements during 1912 of the ground water level in 10 experimental wells about 12 meters (39.36 ft.) deep, distributed according to soil conditions in the Elbe and Bille marsh districts, the Alster river district, and the high and dry district to the right of the Alster river, all in the neighborhood of Hamburg, are reported graphically in correlation with meteorological and flood data for the localities.

In the high and dry district the water table rose in the winter and early spring, and fell in the summer and fall, and was apparently unaffected by the variable local precipitations. In spite of the rainfall the soil water in this district is low in summer, which is said to cause excessive evaporation and consequent lowering of the water table. In the winter the air is too cold to cause excessive evaporation, thus allowing the water table to rise. The water table in the Alster district rose and fell with the Alster River level. In part of the Elbe and Bille marsh districts large and uniform variations in the water level at frequent intervals were observed which corresponded to the Elbe variations due to wind and tide. At higher points in these districts, however,

the water table varied generally with the Elbe but did not show the spasmodic variations.

A study of some water tables at Giza, W. L. BALLS (*Cairo Sci. Jour.*, 8 (1914), No. 92, pp. 102-111, pls. 2).—The results obtained by measurements in 17 tube wells on an area of 30 acres near Cairo, Egypt, are presented graphically and discussed.

With the exception of one hole which was bored 6 meters, the holes for the tube wells were bored 3 meters deep. Measurements were taken weekly and daily, each measurement being computed on the basis of a common bench mark of known elevation. In taking measurements a boxwood scale 4 mm. thick and 5 mm. wide and weighted at its lower end by a loose lead bob of 5 cc. volume was lowered into the well on the end of a light steel chain marked at meter intervals and the wetted length noted. A correction for the rise in water level due to the displacement of the scale and bob was necessary.

The extreme complexity of the subsoil structure is said to have caused very variable behavior in the different wells. Different wells were differently affected by surface irrigation, by seepage from land channels, by infiltration from a canal, by the Nile flood, and by the downflow of water from Upper Egypt coming from canals, out of the river, or from surface irrigation.

The well level in freely permeable soils rose higher during 1913 than the Nile flood. The water table, instead of being stagnant and quiet, responded continually to hydraulic impulses from all directions and from unknown distances. It was never at rest except in isolated clay basins and even there was slightly troubled by meteorological changes.

It is further concluded that irrigation has increased the level of the natural water table of Egypt.

A list of references to related works is appended.

Note on seasonal variation in the composition of drainage water, F. HUGHES (*Cairo Sci. Jour.*, 8 (1914), No. 94, pp. 159, 160).—Weekly analyses of drainage water from irrigated soil showed the maximum amount of dissolved solids in July and the minimum in November. The chlorids showed a nearly constant relation to the total solids, and the alkalinity was extremely constant. As the Nile rises the salinity of the drainage water is said to decrease, and to increase during the period when the canals are closed for the winter.

Decomposition of soil carbonates, W. H. MACINTIRE (*U. S. Dept. Agr., Jour. Agr. Research*, 3 (1914), No. 1, pp. 79, 80).—This is a brief note on the investigations previously noted (*E. S. R.*, 31, p. 815).

The nitrogen content of soils of Scania, Sweden, M. WEIBULL (*K. Ländtbr. Akad. Handl. och Tidskr.*, 53 (1914), No. 2, pp. 65-93; *abs. in Internat. Inst. Agr. [Rome]*, *Mo. Bul. Agr. Intel. and Plant Diseases*, 5 (1914), No. 7, pp. 859-863).—The variation in the nitrate content of soils under different methods of culture and fertilizing was traced. The nitrate content never exceeded 22 parts per million in cropped soils. In fallow soils it rose to 33 parts per million. Under beets it was 14 parts and under wheat and peas from 8 to 9 parts. The nitrate content was low in spring but generally increased in early summer. Cultivation and manuring increased the nitrates. As a rule the soils examined did not contain enough nitrates to meet the requirements of growing crops.

It is concluded that if under normal climatic conditions the nitrate content falls to 2 parts per million before August the need of applying nitrogenous fertilizers is indicated.

Experiments on the rate of nitrification, R. M. BEESLEY (*Jour. Chem. Soc. [London]*, 105 (1914), No. 618, pp. 1014-1024, figs. 3; *abs. in Internat. Inst. Agr. [Rome]*, *Mo. Bul. Agr. Intel. and Plant Diseases*, 5 (1914), No. 7, p. 863).—The

rate of nitrification was determined for carbamid, thiocarbamid, uric acid, asparagin, glycin, acetamid, anilin, sulphate, methylamin sulphate, ammonium oxalate, and ammonium sulphate in a special form of apparatus permitting portions of the nitrifying solution to be withdrawn for examination without danger of contamination by the air. A mixture of hydrolytic and nitrifying organisms obtained from the secondary contact beds of a sewage works was used and the progress of nitrification was traced by periodic determinations of ammonia, nitrous, and nitric nitrogen.

Thiocarbamid and anilin sulphate did not nitrify at all, but 90 per cent of the nitrogen of the latter was converted into ammonia, indicating simply hydrolysis. The rate of nitrification for the other substances was approximately the same, which leads the author to conclude "that nitrogenous substances, typical of the products of albuminoid hydrolysis, when exposed under identical conditions to the action of the bacteria contained in a typical filter-bed, nitrify at approximately the same rate." In no case was more than 95 per cent of the total nitrogen recovered in the form of nitrate.

In the case of ammonium sulphate and oxalate there was a temporary disappearance of nitrogen as measured by the sum of ammonia, nitrous, and nitric nitrogen. The author concludes "that it is in some stage of oxidation intermediate between ammonia and nitrous acid that the nitrogen becomes non-realizable.

"Oxidation by bacterial agency can not be regarded as being of a violent nature, and it seems hardly conceivable that the nitroso-bacteria should be able to oxidize ammonia straight to nitrous acid, without passing through any intermediate stages of oxidation. . . .

"It appears probable that in the oxidation of the ammonium radicle by bacterial agency there are formed, in the course of the reaction, certain intermediate substances which must be regarded as more or less hydroxylated ammonium radicles."

Soil bacteria and soil productiveness, F. LÖHNIS (*Boden-Bakterien und Boden-Fruchtbarkeit. Berlin, 1914, pp. VII+70*).—This pamphlet describes the nature of bacterial life in soils and discusses the activities of soil organisms and ferments with reference to their relation and importance to soil production. It discusses particularly the biological transformation of carbon and nitrogen and nitrogen assimilation in soils, but also deals briefly with the activity of soil organisms in unlocking stores of plant food and in decomposing organic manures.

The productiveness of the soil is considered to depend primarily upon its fertility or plant food content and its activity as determined by the physical, chemical, and biological changes going on in it. The more active the life of the soil the higher is its productiveness. The various direct and indirect means by which these life activities may be controlled with a consequent increase in productiveness of the soil are indicated.

Improving sandy soils by the use of green manure crops, R. W. ALLEN and W. K. DEAN (*Oregon Sta. Bul. 120 (1914), pp. 3-14, figs. 7*).—This bulletin deals with the need of the arid soils for an adequate supply of nitrogen and decaying organic matter, and gives the results of experiments at the Umatilla substation at Hermiston to determine the plants best suited for this purpose under the conditions prevailing at that place.

These experiments indicated that hairy vetch was the most valuable of the crops tested for green manuring on light soils under irrigation, and the methods of growing and handling this crop for the purpose are described.

Fixation of atmospheric nitrogen by means of boron compounds, I. A. STÄHLER and J. J. ELBERT (*Ber. Deut. Chem. Gesell.*, 46 (1913), No. 10, pp. 2060–2077, figs. 6; *abs. in Sci. Abs., Sect. A—Phys.*, 17 (1914), No. 8, pp. 496, 497).—Experiments to determine the conditions under which boron nitrid can be best obtained from naturally occurring boron compounds are reported. "At normal pressures the amount of nitrogen absorbed per gram of boron is much greater with borocalcite than with boron trioxid; only at very high pressures are better results obtained with boron trioxid than with borocalcite."

Synthesis of ammonia from aluminum nitrid, C. MATIGNON (*Chem. Ztg.*, 38 (1914), No. 85, pp. 909, 910).—The technical efficiency and commercial possibilities of this process of preparing ammonia are briefly discussed.

Influence of various conditions on the oxidation of nitrogen in the voltaic arc, A. SAPOZHNIKOVA, A. GUDIMA, and V. KUTOVGO (*Zhur. Russ. Fiz. Khim. Obshch.*, *Chast Khim.*, 45 (1913), No. 5, pp. 1076–1091, figs. 2; *abs. in Sci. Abs., Sect. A—Phys.*, 17 (1914), No. 8, pp. 495, 496).—Experiments with an arc passing between carbon electrodes to determine the influence of air supply and moisture on the yield of nitric acid are reported. As the volume of air increased the ratio of this volume to the power consumed also increased.

A yield of 78 gm. of nitric acid per kilowatt hour was obtained. Moist air gave higher yields than dry. Carbon electrodes are preferred from an industrial standpoint especially if coated electrolytically with nickel on the sides to prevent burning away.

Catalysis of cyanamid and its importance in agriculture, H. KAPPEN (*Die Katalyse des Cyanamids und ihre Bedeutung für die Landwirtschaft. Jena*, 1913, pp. 119; *abs. in Centbl. Bakt. [etc.]*, 2. Abt., 41 (1914), No. 9–10, pp. 283, 284).—In experiments with various soil colloids and metallic oxid and hydroxid as catalyzators of calcium cyanamid, it was found that the most active substance in producing urea from the cyanamid was manganese peroxid. There seemed to be a direct relation between cyanamid cleavage and the amount of organic matter and the growth of fungi and bacteria in the soil.

The formation of urea from the cyanamid is considered of special agricultural importance because the urea has been found to be very effective as a nitrogenous fertilizer.

Action of carbon dioxid on crude calcium cyanamid [nitrolime], C. MANUELLI (*Ann. Chim. Appl. [Rome]*, 1 (1914), pp. 493, 494; *abs. in Jour. Soc. Chem. Indus.*, 33 (1914), No. 18, p. 933).—"Some of the difficulties met with in the use of nitrolime as a fertilizer have been attributed to the presence of free lime, and it has been suggested that the latter might be converted into carbonate by substituting carbon dioxid for nitrogen in the furnace during the cooling of the nitrolime. In two experiments in which nitrolime was cooled from 800° to 480° C. in one-half hour and from 800° to 500° C. in one hour in a current of carbon dioxid there were, however, losses of 12 per cent and 29 per cent, respectively, of the total nitrogen of the nitrolime."

The influence of fineness upon the availability of bone meal, S. S. PECK (*Jour. Indus. and Engin. Chem.*, 6 (1914), No. 11, pp. 922–926; *abs. in Chem. Abs.*, 8 (1914), No. 23, p. 3833).—This article reports the results of attempts to determine the availability of bone meal of different degrees of fineness by means of the rate of ammonification and nitrification of the organic nitrogen of the bone meal, and also by measuring the amount of phosphoric acid rendered soluble by bacterial action in sand cultures.

The results indicate that there is a direct correlation between the fineness and rate of ammonification and nitrification, and that the solubility of bone phosphate is directly influenced by bacterial action as indicated by ammonification and nitrification.

The author concludes that the standard of fine bone meal should require that 65 per cent of it should pass a 50-mesh sieve, and that 90 per cent of the remainder should pass a 25-mesh sieve.

Phosphate rock, W. H. WAGGAMAN (In *The Mineral Industry: Its Statistics Technology, and Trade during 1913*. New York and London, 1914, vol. 22, pp. 575-594).—Statistics of production and consumption of phosphate rock in the United States and abroad during 1913 as compared with previous years are summarized and discussed in this article. The character and possible yield of the various phosphate beds are also discussed and a bibliography of the subject is given.

Potassium salts (In *The Mineral Industry: Its Statistics, Technology, and Trade during 1913*. New York and London, 1914, vol. 22, pp. 607-621).—Statistics of the trade in potash salts during 1913 as compared with those of previous years are summarized and a brief account is given of the attempts to develop sources of supply of potash in the United States.

A bibliography of the subject is given.

Potash deposits in Spain, C. B. HURST (*Daily Cons. and Trade Rpts. [U. S.]*, 17 (1914), No. 261, pp. 615-617).—It is stated that while no careful surveys have been made there is evidence to warrant the belief that considerable deposits of potash exist in certain provinces of Cataluna. The government has granted a number of concessions covering possible deposits of potash, but is undertaking to make investigations with a view to determining the extent of such deposits and making reservations.

The preparation of potash from feldspar and other sources (*Chem. News*, 110 (1914), No. 2863, p. 175).—This is a brief review of methods which seem to have most promise of meeting the emergency demand for potash created by the European war. Attention is called especially to a patented process based upon the reduction of feldspar by fusion with fluorspar and calcium carbonate.

Granitic soil potassium and its relation to the production of hay, B. E. CURRY and T. O. SMITH (*New Hampshire Sta. Bul.* 170 (1914), pp. 32, figs. 7).—This bulletin reports a continuation of previous investigations on certain granitic New Hampshire soils (E. S. R., 28, p. 30).

These soils are, as a rule, abundantly supplied with potash. Percolation experiments with a solution of potassium chlorid showed that in spite of this fact the soils absorbed additional amounts of potash from the solution. The richer the soil in clay and also in potash, the greater the absorption. The absorbed potash was held so strongly that it was difficult to recover it by leaching with water. Dilute solutions of sodium nitrate, sodium chlorid, sodium carbonate, and acid phosphate released considerable amounts of the soil potash, the first and last named being especially active. Calcium oxid and carbonate did not release potash. Calcium sulphate set free a small amount.

A study of the results obtained in experiments in growing hay on these soils indicates that nitrogen and not potash is the limiting factor. The supply of potash is apparently sufficient even for the increased growth resulting from the application of nitrogenous fertilizers. The author therefore concludes that the common practice of top-dressing grass land with potash fertilizers can not be expected to be profitable on such soils.

Frequent and thorough cultivation, with rotation of crops to create favorable conditions for increasing the availability of the soil potash, and the use of sodium nitrate, ammonium sulphate, acid phosphate, and acidulated fertilizers in general which tend to increase the solubility of the potash, are suggested as preferable to applications of potash fertilizers.

Lime in agriculture (*Farmers' Ed. and Coop. Bur. [South Settlement and Development Organ., Pub.]*, pp. 37, pls. 2).—This pamphlet contains a series

of articles, namely, A Day of Fads, by W. F. Massey; The Oldest Chemical Fertilizer, by K. Langenbeck; Is the Recommendation that Only Ground Limestone Should be Used for Agricultural Purposes a Sound and Rational One? by H. J. Wheeler; and Some Phases of the Relation of Lime to Soil Improvement, by E. O. Fippen. These papers set forth the relative merits of quicklime and ground limestone for fertilizing purposes and deal particularly with the views expressed by C. G. Hopkins in his pamphlet on Ground Limestone for Southern Soils (E. S. R., 31, p. 322).

Experiments on the effect of different forms of lime, D. MEYER (*Illus. Landw. Ztg.*, 34 (1914), No. 61, pp. 571, 572).—In comparative tests of quicklime, pure calcium carbonate, ground limestone, and the waste lime product from the manufacture of sodium and potassium chlorids on mustard and horse beans the fertilizing effect of the waste product was 82 as compared with 100 for the calcium carbonate and limestone and 95 for burnt lime.

Gypsum, F. A. WILDER (In *The Mineral Industry: Its Statistics, Technology, and Trade during 1913*. New York and London, 1914, vol. 22, pp. 372–381).—Statistics of the gypsum industry in the United States and foreign countries for 1913 are summarized. The principal uses which are made of gypsum are also briefly discussed. It is stated that the amount used as land plaster has remained nearly stationary during the last four years, but the price dropped from \$2.02 to \$1.75 in 1913.

AGRICULTURAL BOTANY.

Relative water requirements of plants, L. J. BRIGGS and H. L. SHANTZ (*U. S. Dept. Agr., Jour. Agr. Research*, 3 (1914), No. 1, pp. 1–64, pls. 7, fig. 1).—In continuation of the authors' investigations on the water requirements of plants (E. S. R., 29, p. 825), accounts are given of further experiments carried on at Akron, Colo., with a large number of crops. In these experiments it was found necessary to protect the plants from birds, winds, and hailstorms by the erection of an inclosure, and tests showed that this inclosure reduced the solar radiation to about 80 per cent of its normal value. Under the conditions of the experiment the average amount of water required to form 1 lb. of dry matter of various crops was as follows:

Water required to form one pound of dry matter in various crops.

Kind of crop.	Water requirement.	Kind of crop.	Water requirement.
	<i>Pounds.</i>		<i>Pounds.</i>
Proso.....	293	Beans.....	728
Millet.....	310	Soy beans.....	744
Sorghum.....	322	Sweet clover.....	770
Corn.....	368	Field peas.....	788
Teosinte.....	383	Vetches.....	794
Wheat.....	513	Clovers.....	797
Barley.....	534	Alfalfa.....	831
Buckwheat.....	578	Wheat grass and brome grass.....	861
Oats.....	597	Tumbleweed and pigweed.....	287
Rye.....	685	Purslane.....	292
Rice.....	710	Buffalo grass.....	308
Flax.....	905	Russian thistle.....	336
Sugar beet.....	397	Buffalo grass and grama grass.....	389
Potato.....	636	Cocklebur.....	432
Cabbage, turnip, and rape.....	640	Gum weed.....	608
Cotton.....	646	Mountain sage.....	616
Watermelon.....	600	Sunflowers.....	683
Cantaloup and cucumber.....	667	Lamb's quarters.....	801
Squash and pumpkin.....	791	Marigold.....	881
Cowpea.....	571	Western ragweed.....	948
Chick-pea.....	663	Western wheat grass.....	1,076

Evaporation and soil moisture in relation to the succession of plant associations, G. D. FULLER (*Bot. Gaz.*, 58 (1914), No. 3, pp. 193-234, figs. 27).—The author gives data collected during several years as to various plant associations near Chicago, Ill., stating among other conclusions that the ratios between evaporation and growth water in the beech-maple forest, oak-hickory forest, oak dune, pine dune, and cottonwood dune associations have the comparative values of 100, 65, 20, 17, and 15, respectively, and that these differences may be the cause of succession. The midsummer conditions of the prairie association seem to be decidedly xerophytic.

A bibliography is given.

Branch development in a perennial plant, G. ANDRÉ (*Compt. Rend. Acad. Sci. [Paris]*, 158 (1914), No. 21, pp. 1517-1520).—Reporting on his more recent work (*E. S. R.*, 29, p. 218), and giving the results of analytical studies made at five dates in the development of chestnut shoots as to the leaf and twig content in dry matter, ash, nitrogen, phosphoric and sulphuric acids, and calcium, magnesium, and potassium oxids, with the seasonal variations observed, the author states that the annual shoot is found to increase considerably in absolute nitrogen and in fixed materials, and that the leaf increases continually in content of assimilated materials, excepting phosphoric acid, until the latter part of the growing period. October 8, about two weeks before the leaves begin to fall, they were found to contain the greater part of the material appropriated. The annual branch as a whole retains in the main the substances that have been accumulated, the leaves giving up very little of any component except nitrogen and phosphoric acid until just before their separation from the branch.

Rapidity of hydrolysis and of removal by water of the nitrogenous and mineral matter in leaves, G. ANDRÉ (*Compt. Rend. Acad. Sci. [Paris]*, 158 (1914), No. 24, pp. 1812-1815).—Reporting exact analyses at several periods during the growth of chestnut leaves, the author states that the general conclusions presented above are sustained in the work here noted. The exosmosis of minerals from the leaves is given as regards nitrogen, phosphorus, and potassium, and is stated to have increased for these components in the order named.

The relative chemotropic influence of salts of metals on radicles of *Lupinus albus*, T. M. PORODKO (*Ber. Deut. Bot. Gesell.*, 32 (1914), No. 4, pp. 271-275).—Continuing previous work on *L. albus* (*E. S. R.*, 31, p. 325), but employing herein salts of metals, the author details in tabular form the results obtained, stating that all the salts tested gave negative tropisms.

Conditions of chemotropism in rootlets, T. M. PORODKO (*Ber. Deut. Bot. Gesell.*, 32 (1914), No. 4, pp. 275-282, figs. 2).—Continuing the above work, and giving details and curves obtained therefrom, the author states that both positive and negative tropism occur only with limited strengths of certain substances named, and that chemotropic sensitivity is limited to about 1 to 2 mm. of the root tip.

Zinc in glass containers as a source of error in studying the biological influence of chemicals, M. JAVILLIER (*Compt. Rend. Acad. Sci. [Paris]*, 158 (1914), No. 2, pp. 140-143; *abs. in Jour. Chem. Soc. [London]*, 106 (1914), No. 617, I, pp. 364, 365).—Experiments cited, employing *Sterigmatocystis nigra*, showed a gain in dry weight on the addition of zinc to cultures in flasks of quartz and of Bohemian glass, but not to cultures in Jena glass, the differences being attributed to zinc present in Jena glass. This influence of traces of zinc in such glass may, it is thought, prevent accuracy of results in delicate tests.

The mobility of potassium in vegetable tissue, L. MAQUENNE and E. DEMOUSSY (*Compt. Rend. Acad. Sci. [Paris]*, 158 (1914), No. 20, pp. 1400-1404).—Analyses of portions of several kinds of plants subjected to an electrolyzing

current are said to have shown that potassium may be made to pass for a considerable distance into vegetable tissues.

The function of manganese in plants, W. P. KELLEY (*Bot. Gaz.*, 57 (1914), No. 3, pp. 213-227).—This is a shorter account of work already noted (*E. S. R.*, 27, p. 129).

The mechanism of oxidation and reduction in vegetable tissues, J. WOLFF (*Compt. Rend. Acad. Sci. [Paris]*, 158 (1914), No. 16, pp. 1125-1127).—Describing experiments producing oxidation and reduction in tissues and juices of apple and pear and in solutions, and referring in this connection to the claim of Lindet (*E. S. R.*, 6, p. 775) that brown coloration in juices or in bruised tissues of pome fruits is due to the presence of a diastase, also to that of Bourquelot and Fichtenholz (*E. S. R.*, 24, p. 31) that arbutin was demonstrated in pear leaves, the author claims that the phenomena here described show a causal relation to the same general sort of mechanism demonstrated in those experiments.

The influence of vertical illumination upon growth of the coleoptile of *Avena sativa*, E. VOGT (*Ber. Deut. Bot. Gesell.*, 32 (1914), No. 3, pp. 173-179, fig. 1).—The author gives some results of tests made by himself on the influence of vertical illumination of the coleoptile of *A. sativa*. Graphically represented data show little change during exposure, but a subsequent slight check in elongation of this part for 12 minutes, then a steep rise for about 18 minutes, followed by a somewhat less steep decline for about 45 minutes, with two decreasing interruptions, to the original rate of growth.

The investigations here sketched tend to show that artificial vertically incident light of not too high intensity or too long duration exerts a predominantly favorable influence upon the rate of elongation of *A. sativa*, while shading tends to check the growth in plants accustomed to light; also that sudden and considerable change in illumination acts as a stimulant, to which this portion of the plant reacts in somewhat rhythmical alterations of growth rate.

Study of rest period in potato tubers, C. O. APPLEMAN (*Maryland Sta. Bul.* 183 (1914), pp. 181-226, figs. 18).—The author has given the results of a biochemical and physiological study of the rest period in tubers of *Solanum tuberosum*.

It was found that under normal planting conditions potato tubers will not sprout for several weeks after harvest. During this rest period certain changes occur which are essential to the growth processes. These changes are spoken of as after-ripening. The carbohydrate transformation during the rest period was found to be entirely dependent upon changes in temperature. Active diastase and invertase were found present at all stages of the rest period, but showed no increase under normal growing conditions until the tubers began to sprout. The oxidation of pyrogallol was more active when juices from tubers at the end of the rest period were used than with those from immature tubers. After-ripening, it is claimed, does not involve protein hydrolysis. Protein, lipid, organic extractive, and inorganic phosphorus, calculated to percentage of total phosphorus, remained constant up to the time of sprouting. The metabolic changes involving these forms of nitrogen and phosphorus began rather suddenly and were concurrent with sprouting, and the same was true with regard to diastase.

Suberization reduces permeability of the skin to water and gases. It was found that potatoes may be sprouted at any time during the rest period by removing the skin and supplying the tubers with favorable growing conditions. The earliest sprouting occurred when the skins of the tubers had been removed and the potatoes cut transversely.

It was claimed that subdued light stimulates growth in buds on new tubers with slightly suberized skins, but that the light influence disappears entirely when the skin is removed. The rest period of new potatoes was shortened by wrapping the tubers in cotton saturated with hydrogen peroxid, the abundant catalase in the potato tuber decomposing the hydrogen peroxid diffused through the skin and liberating free oxygen.

The above treatments greatly accelerated the rate of respiration, and the author concludes that the elimination or abbreviation of the rest period is correlated with increased oxygen absorption. The rest period, it is claimed, is not firmly fixed and hereditary, nor is it due to autogenic metabolic changes, as it can be eliminated, as shown above. In nature the oxygen supply to internal tissues is said to be regulated by skin characters which are greatly influenced by moisture relations.

A bibliography is given.

Enzymatic peptolysis in germinating seeds, DOROTHY COURT (*Proc. Roy. Soc. Edinb.*, 34 (1913-14), No. 2, pp. 113-127).—Results given of experiments described are said to indicate the presence in germinating barley of two different peptolytic enzymes, one of which can be readily extracted with water while the other is apparently of the nature of an endo-enzym and can be obtained only by destroying the cells of the seed tissues. The temperature curves of the two, as noted in connection with the tests made, are also said to differ materially.

This view of the nonidentity of these enzymes is said to have been confirmed by further experiments carried out with fruit of the pineapple (*Ananassa sativa*), also with several fungi named.

Blooming of rice and associated phenomena, M. AKEMINE (*Ztschr. Pflanzenzücht.*, 2 (1914), No. 3, pp. 339-375, figs. 6).—Numerically and graphically represented results are given, with detailed conclusions of studies carried out by the author regarding the development of the rice flower; alterations in the sizes and relations of the flower parts during the flowering period and the influence thereon of external conditions; the relations between time or succession of blooming and grain weight; and grain formation as influenced by weather.

A bibliography is appended.

Studies on the lactiferous tubes and cells of some native plants, R. KŌKETSU (*Jour. Col. Sci., Imp. Univ. Tokyo*, 35 (1913), Art. 6, pp. 57, pls. 3, fig. 12).—This work deals with the structure, functions, and contents of lactiferous tubes and cells in a number of plants studied, the results of which are given in some detail. It is held that the primary significance of lactescence is ecological rather than physiological.

Genetic studies on seeds of *Phaseolus vulgaris*, B. KAJANUS (*Ztschr. Pflanzenzücht.*, 2 (1914), No. 3, pp. 377-388).—The author gives detailed results of a study with about 20 different strains of bush beans in regard to some apparent divergences and spontaneous hybridization and the more or less continuous hereditary coloration of violet marbled types of seeds. The indicated results were only in partial agreement with those of some of the other authors mentioned.

Studies in selection and crossing in mottled horse beans, L. KIESSLING (*Ztschr. Pflanzenzücht.*, 2 (1914), No. 3, pp. 313-338).—Horse beans bred selectively for three years still manifested impurity of stock as regards coloration in some lines, which showed a white and yellow mottling of the leaves. Later the hereditary abnormality became more noticeable, some plants which showed a more pronounced degree of abnormality dying before or after emergence from the soil, and others recovering.

Inoculation studies including spraying and injection with sap of abnormal plants showed no results, but further breeding seemed to show that the tendency

to abnormal deficiency of chlorophyll was inherited through both parents and followed the Mendelian scheme, the phenomenon being divisible into different and heritable degrees.

Utilization of crossing for study of phylogenetic questions in connection with the grains, E. VON TSCHERMAK (*Ztschr. Pflanzenzücht.*, 2 (1914), No. 3, pp. 291-312, fig. 1).—The author gives data obtained by crossing among varieties within each of four species of domestic grains, showing in some detail the phylogenetic relations claimed to have been indicated by these results in certain cases, among which are mentioned some alleged evidence of derivation of cultivated rye from *Secale montanum*, separation of burleys into a distichum and polystichum series, exclusion of *Aegilops ovata* as a primitive form from the ancestry of cultivated wheat, and derivation of some or all forms of domestic panicle and side oats from the wild species *Avena fatua*.

Parallel mutations of *Oenothera biennis*, T. J. STOMPS (*Ber. Deut. Bot. Gesell.*, 32 (1914), No. 3, pp. 179-188).—Discussing some studies previously reported in part (E. S. R., 28, p. 40), the author claims that there is now no reasonable ground for doubting that genuine mutants have been obtained from *O. biennis*.

Anomalies of development in maize, G. BOHUTINSKY (*Ber. Deut. Bot. Gesell.*, 32 (1914), No. 3, pp. 222-248, figs. 14).—The anomalies of maize here illustrated and described pertain to the shoot, tassel, ear, and grain of this plant, which also shows some interesting peculiarities as regards sex.

FIELD CROPS.

Agriculture, Z. DOMINGUEZ (*Agricultura. Mexico*, 1913, pp. 391+XIII, figs. 236).—The first 304 pages of this book treat in detail of the production of corn from the selection of seed, culture, harvest, and the manufactured products. The remainder of the book treats, in a general way, of the production of wheat, barley, oats, cotton, and legumes. The work has special reference to methods and systems employed and adaptable to Mexican conditions.

Intensive farming in India, J. KENNY (*Madras and London*, 1912, pp. V+585+XI, figs. 2).—This book consists of papers previously published singly and treats of methods of improving agricultural conditions in India, comprising some first lessons in agriculture covering the air, soil, plant, and manures, and including results of improved methods of cultivation and fertilization with rice, cotton, wheat, sugar cane, tobacco, tea, coffee, coconuts, potatoes, and onions.

A report of the experimental and demonstration work on the substation farms at Moro, Burns, Redmond, and Metolius.—I, Tillage and cropping methods, H. D. SCUDDER (*Oregon Sta. Bul.* 119 (1914), pp. IV+188, figs. 87).—"This bulletin is written as a popular report of the experimental and demonstration work carried on at the eastern Oregon dry farming substation, Moro, Sherman County; the Harney branch experiment station, Burns, Harney County; the dry land demonstration farm, Metolius, Crook County; and the irrigation demonstration farm, Redmond, Crook County. It covers the work of each farm since its establishment to the end of the year 1913, giving the essential facts for each as to the conditions encountered, plan of the work, important results obtained, and conclusions and recommendations as to tillage and cropping methods, in each different region. No technical discussion of the results obtained is entered upon, if for no other reason than that the work has only proceeded at Moro for four years, at Burns two years, and at Metolius and Redmond one year. All the discussions bear particularly upon the advantages and feasibility of a more diversified and intensive sort of farming than that now prevalent in the eastern Oregon region."

The cropping methods discussed refer to winter and spring wheat, barley, oats, emmer, rye, corn, buckwheat, alfalfa, field peas, field beans, soy beans, broad beans, vetch, crimson and sweet clover, Tangier pea, grasses, sorghums, rape, kale, squash, potatoes, artichokes, mangels, turnips, carrots, sugar beets, flax, cabbage, and onions.

Fertility and crop experiments at the West Tennessee Station, C. A. MOOERS and S. A. ROBERT (*Tennessee Sta. Bul. 109 (1914), pp. 215-244, figs. 9*).—In the work recorded in this bulletin two types of soil were used, described as a light, brown-colored silt loam with a yellowish-colored subsoil, and a gray-colored, "crawfishy" type, with a gray subsoil. This latter described soil is noted as being very high in silt, does not drain readily, and is troublesome to handle.

It is noted that the requirements of these soils for phosphoric acid and potash are very slight, and that applications of these fertilizers increased crop yields but not to a profitable degree.

In studying the effect of burnt lime and ground limestone applied at the rates of 2,000 lbs. and 4,000 lbs., respectively, per acre, it was observed that increased yields of corn, oats, and red clover followed the applications of lime on both types of soils; that cotton and cowpeas were little influenced, frequently being slightly injured, and that the returns from the two forms of lime were very similar with the two tons of ground limestone showing slightly superior. These results are given in tabular form.

Experiments in regard to time of application of nitrate of soda showed that "the results with the corn point very definitely to the application of the nitrate at an early stage of growth, the gain being greatest when the plants were from 3 in. to 2 ft. high. . . . In none of the three series from which the averages were obtained did any increase in yield of grain result from applications made at tasseling time, the only apparent effect being a deeper green foliage.

"The results of the experiments on Irish potatoes are of special interest, as three of the four sets were made on the fine sandy loams of the Cumberland Plateau, which might be expected to suffer from leaching. In practically every one of the four sets nearly as good results as any were obtained when the nitrate was mixed with the phosphate and potash applied in the row before planting. This was rather unexpected, for the rainfall at this time of the year is heavy, so that loss of nitrate would be looked for. The results from applying one-half of the nitrate as a top-dressing when the plants were just coming up, and the balance in ten days or two weeks, were unfavorable to this method. As with the corn, the results are, therefore, decidedly in favor of an early application."

In testing nonlegumes and legumes as green manure the results obtained showed nonlegumes other than rye to be unsatisfactory, while legumes continued to improve the soil fertility year after year.

Notes are given on the seeding and fertilization of alfalfa, red, alsike, crimson, Japan, and sweet clovers, soy beans, grasses, cotton, corn, wheat, oats, barley, rye, and sorghum. A guide to the establishment of a rotation is shown and the different phases of it are discussed.

Variety tests on moor, marsh, and flooded soils, F. BRÜNE (*Jahrb. Deut. Landw. Gesell., 29 (1914), No. 2, pp. 351-377*).—This paper gives results of testing the crops bred and grown on these types of soils as compared with crops grown from seed raised on ordinary soils. These results, obtained with cereals, potatoes, field beans, and mangels, and given in tabular form, have led the author to note a wide field of possibilities in the breeding of crops acclimatized

on these types of soils. Such crops invariably outyielded others, even when highly bred on the uplands.

A text-book of grasses, with especial reference to the economic species of the United States, A. S. HITCHCOCK (*New York, 1914, pp. XVII+276, figs. 64*).—Primarily a text-book of 25 chapters, this contains some reference matter, and although the chief emphasis is placed on systematic agrostology, this comprising part 2, a brief outline of economic agrostology is presented in part 1.

Alfalfa experiments, L. CARRIER, E. R. HODGSON, R. P. COCKE, and B. G. ANDERSON (*Virginia Sta. Bul. 207 (1914), pp. 3-20, figs. 5*).—This bulletin gives cultural methods and results of experiments, in cooperation with the State Department of Agriculture, which are summarized as follows:

"August seeding is preferable to spring seeding. Liming is usually necessary, even on limestone soils. Experiments at Appomattox and Williamsburg showed very marked benefit from liming. At Staunton little benefit was observed.

"Acid phosphate and basic slag have given the most marked results on alfalfa of any commercial fertilizer, especially when used in connection with a liberal application of stable manure. At Williamsburg, in Tidewater, a plat seeded in September, 1912, and fertilized with 10 tons of manure and 400 lbs. acid phosphate per acre yielded at the rate of 6 tons per acre in 1913 [as against 2 tons 356 lbs. without fertilizers]. At Staunton, in the Shenandoah Valley, alfalfa fertilized with 15 tons of stable manure alone yielded 6 tons per acre in 1913 and 2½ tons the first cutting in 1914. The use of inoculating soil is strongly recommended over any other method. Pure cultures are a less desirable, but practicable substitute. The experiments on rates of seeding, using from 10 to 30 lbs. per acre, gave very little difference between light and heavy seedings. On a good seed bed 15 lbs. should be sufficient. A comparison of alfalfa seeded alone with alfalfa seeded with other grasses or clovers indicates that it is the best to seed it alone."

The cultivation of Turkestan alfalfa, J. GYÁRFÁS (*Monatsh. Landw., 7 (1914), No. 8, pp. 192, 193*).—This discusses results obtained in Hungary at 26 different centers that show the inferiority of Turkestan alfalfa as compared with the native varieties.

A more accurate method of comparing first-generation maize hybrids with their parents, G. N. COLLINS (*U. S. Dept. Agr., Jour. Agr. Research, 3 (1914), No. 1, pp. 85-91*).—The author states that "the development of satisfactory methods of comparing the yield of first-generation hybrids with that of their parents has been retarded by (1) a failure to fully appreciate the importance of individual diversity in hybrids, (2) the abnormal behavior of self-pollinated maize plants, and (3) the difficulty of securing for comparison hybrids and parents with identical ancestry.

"To compare the behavior of two varieties, which may be called A and B, with that of a hybrid between them, two plants were selected in each variety, A1 and A2 in the one variety, and B1 and B2 in the other variety. The following hand pollinations were made: A1×A2, A2×B1, B1×B2, and B2×A1. The result is two hybrid ears and one cross-pollinated ear of each variety. It is believed that the mean yield produced by seed from the two hybrid ears compared with the mean yield produced by seed from the two pure seed ears gives a fair measure of the effects of hybridization. By making two hybrids involving all the plants used in producing the pure seed ears individual differences that affect the yielding power of the pure seed ears are similarly represented in the hybrids. Thus in both the parents and the hybrids the average yield represents the mean yielding power of the four parent plants, the only

difference being the way in which the individuals are combined. To secure the most accurate comparison of the yield of the four ears, one seed from each of the ears was planted in each hill. The different kinds were identified by their relative position in the hill."

The figures in the following table express average percentages of the mean of the four kinds:

Yield and height of two varieties of sweet corn and hybrids between them.

Variety of corn.	Yield.	Height.
	<i>Per cent.</i>	<i>Per cent.</i>
Egyptian.....	112.8±4.6	111.3±1.0
Voorhees Red.....	55.6±4.0	84.0±0.9
Egyptian+Voorhees Red.....	89.0±5.1	100.0±1.2
Voorhees Red+Egyptian.....	142.8±4.3	103.6±1.1

Further data give the height, number of suckers, total number of leaves, exertion of tassel, length of axis of tassel, length of central spike, number of primary branches in tassel, number of secondary branches in tassel, length of longest leaf, number of nodes above longest leaf, and number of nodes above the ear of the above-named varieties and their hybrids.

Inheritance of endosperm texture in sweet × waxy hybrids of maize, G. N. COLLINS and J. H. KEMPTON (*Amer. Nat.*, 48 (1914), No. 574, pp. 584-594, fig. 1).—This continues the report of work previously noted (*E. S. R.*, 29, p. 35), which covered the first and second generations. "The third generation, like the second, gave results sufficiently close to dihybrid ratios to render unprofitable the assumption of more complicated ratios. There are, however, deviations from the expected numbers of too great magnitude to be ascribed to chance.

"The ratios of waxy to nonwaxy seeds were regular as far as the conditions of the experiment could determine, except for a slight excess in the number of waxy seeds in nearly all the ears in which all three classes appeared. A deviation in number of waxy seeds as large as that shown in the total would not be expected to occur as the result of chance more often than once in 1,000 times. The ratios between sweet and horny, while approximating the predicted ratios, show numerous irregularities. Wherever there is a significant deviation in the number of sweet seeds, the observed number is below the expected. Reasons are advanced for believing that the deficiency of the sweet class may result from a failure of some sweet seeds to develop a wrinkled exterior rather than from any irregularities in segregation.

"The results show the value of representing the characters by gametic factors. This method provides an orderly arrangement of the facts of heredity thus far observed with respect to these characters, and makes possible fairly accurate predictions regarding the genetic behavior of the various seed classes."

Corn growing in Montana, M. L. WILSON (*Montana Sta. Circ.* 41 (1914), pp. 49-74, figs. 31).—This circular is addressed primarily to those who have had some experience with corn and desire information upon the methods which they should practice in Montana. The difference between Montana and eastern and southern corn growing is brought out in the discussions on culture, eradication of the Russian thistle, harvesting, stacking, threshing, and the preparation of corn stubble for small grain. The group characteristics of early flint, early dent, semident, late flint, and late dent varieties of corn are given.

The successful use of the ordinary threshing machine for threshing the Montana type of the dry crop as it comes from the field or stack is noted. The resulting products are shredded fodder, cobs, and shelled corn.

Labor cost of producing corn in Ohio, L. H. GODDARD and W. L. ELSEY (*Ohio Sta. Bul.* 266 (1913), pp. 85-124, figs. 14).—The work reported in this bulletin was carried on in cooperation with the Office of Farm Management of this Department, and consists of data compiled from a survey comprising nearly 200 fields, with a total of more than 2,000 acres, representing 23 counties of the State.

The rate of wages paid farm laborers ranged from 83 cts. to \$1.55 per day with board, and from \$16.28 to \$25.42 per month with board. The total cost of labor required for producing corn that yields an average of 36.57 bu. per acre is given as 33.7 cts., and for that yielding an average of 74.85 bu. per acre as 28.8 cts. per bu.

"The labor cost is the largest single item in the total cost of producing corn. From the fields under consideration it is found that the total labor required is 48.18 man hours and 55.44 horse hours, or, at 16 cts. per hour for man and 8 cts. per hour for horse labor, the cost is \$12.14 per acre. Replies from 34 Ohio municipalities having an average population of 5,831 show the average wage per hour for common laborers to be approximately 19 cts., for the common laborer with team 44 cts. When figured at these rates the labor cost per acre of producing corn for the State is \$16.08. . . .

"In many cases the crop yield is not sufficient to pay for the single item of labor required to produce it unless the labor is figured at an extremely low rate. Within certain limits, at least, the labor cost per acre is less on large fields than on small ones. The man labor per acre of replanting, which is still a common custom, is more than is required to make the first planting by machine. A large amount of hand labor, especially in cultivating, is done on the corn crop. It would seem that much of this could well be avoided. The labor cost of harvesting is more than one-third the total labor cost. An appreciable amount of labor is therefore saved when the crop is harvested by live stock in the field."

Data are also included as to the cost of various methods of harvesting the crops and the relative amount of labor expended in growing it on fields of various shapes and sizes.

Improving cotton by seed selection on the farm, R. Y. WINTERS (*North Carolina Sta. Circ.* 21 (1914), pp. 6, figs. 5).—This circular gives detailed directions for improving cotton in North Carolina by the plant-to-row method of selection.

Flax cropping, harvesting methods, H. L. BOLLEY and M. L. WILSON (*North Dakota Sta. Circ.* 1 (1914), pp. 32, figs. 43; *Montana Sta. Circ.* 40 (1914), pp. 17-48, figs. 43).—This continues discussions previously noted (*E. S. R.*, 29, p. 634), and is published jointly and simultaneously by these stations. It relates to saving the crop, and discusses good seed, weed pests, diseases, weather and soil conditions that influence the ripening of flax, the state laboratory, preparing and harvesting the seed plot, when to cut for seed, harvesting the general crop, short irregular flax, stacking headed flax, threshing, storage, handling, shipping, flax straw and its uses, and feeding green or frosted flax.

It is noted that "it is a fundamental feature of flax cropping that seed, to be of good strength and reasonably free from the diseases which are destructive to the crop, must be harvested and saved dry."

"When properly handled in proper rotation, flax can be grown successfully on old lands. Flax is a valuable crop to complete a rotation for small grains. Therefore it should be a part of farm policy in this region to take all of the steps necessary to establish the flax crop in the new but rapidly developing system of diversified farming."

Flax experiments, 1912 (*Dept. Agr. and Tech. Instr. Ireland Jour.*, 14 (1914), No. 3, pp. 515-534).—The reports of manurial tests at several centers showed muriate of potash alone to be unproductive. Combined applications of muriate of potash and sulphate of ammonia gave profitable returns, but when steamed bone flour was added to the potash and ammonia the yields were decreased below the check plats. The addition of 1 ton of burnt lime per acre to the primary crop (oats) proved beneficial to flax. "Apart from its value to other crops, the results of these preliminary trials indicate that the liming of land one year in advance is of considerable benefit to the flax crop. They also show that for flax muriate of potash forms a valuable supplemental dressing to lime."

The use of sweet jowar (*Sorghum* sp.) as a source of commercial sugar or as a fodder and the variation in composition of the crop during growth, H. E. ANNETT (*Agr. Research Inst. Pusa Bul.* 41 (1914), pp. 9+VI, pls. 2).—This records analyses of sweet sorghums grown at several places in India that show they can not be profitably grown for sugar purpose. As a source of fodder, however, these sorghums were shown to be useful. Yields of 13 tons of green produce were obtained per acre. Data "show that after the seed is in the thin milk stage no increase in total weight of the crop takes place, and also the amount of total sugar in the crop has almost reached its maximum. Hence the crop, when being cut for fodder, should not be allowed to get beyond this stage."

Potato growing in the San Joaquin and Sacramento deltas of California, W. V. SHEAR (*California Sta. Circ.* 120 (1914), pp. 11, figs. 7).—This circular describes the conditions of potato production in these areas, mentions *Rhizoctonia*, *Fusarium oxysporum*, *Verticillium albo-atrum*, scab, tuber moth, nematode gall worm, as directly responsible for the decrease yields, and makes general recommendations for the improvement of the industry, notably longer rotations and the use of disease-free seed potatoes.

Rape for hog pasturage, C. B. WILLIAMS (*North Carolina Sta. Circ.* 20 (1914), pp. 3).—This circular discusses the possibilities of the crop and gives advice regarding soil and its preparation, seeding, and precautions in grazing.

Report of experimental work of the rice stations in 1913 in the Province of Valencia, Spain, E. G. MONTESORO (*Mem. Estac. Arrocera Sueca (Valencia)*, 1913, pp. VI+44, pls. 8).—This outlines the first year's work, and gives some results of variety tests and cultural and fertilizer experiments with rice at three stations.

Sugar beet experiments (*Dept. Agr. and Tech. Instr. Ireland Jour.*, 14 (1914), No. 3, pp. 471-482, pls. 2).—The results of cultural experiments with sugar beets in Ireland are given as follows:

"With proper care and management, crops of sugar beets comparing favorably in yield with continental crops can be grown in Ireland. For example, in spite of somewhat adverse weather conditions, in 1912 and 1913, an average yield of over 10 tons (factory weight) per statute acre was obtained from the molded-up drill plats. The sugar content of the roots was also satisfactory; the average in 1911 was 18.5 per cent. In 1912 and 1913, the average was 18.2 and 14.6 per cent, respectively.

"Of the three methods of cultivation, the system of growing the crop on molded-up drills was the best.

"Top-dressings of nitrate of soda to beets manured with (a) a moderate dressing of farmyard manure and a complete mixture of artificials (including sulphate of ammonia), or (b) a rather heavier dressing of the same mixture of artificials without dung, were not generally remunerative.

"The factory weight was rather less than three-quarters that of beets roughly cleaned and topped. The yields from the best plats were about half those of mangels grown alongside."

Summary of ten years' experiments with tobacco in Virginia, E. H. MATHEWSON (*Virginia Sta. Bul.* 205 (1914), pp. 3-35, figs. 6).—This bulletin summarizes in a general way work that has been previously noted in detail (E. S. R., 20, p. 333; 22, p. 37; 25, p. 734; 27, pp. 436, 437). Descriptive notes are here given of bright, dark, sun-cured dark, and olive-green or black-stemming types of tobacco. The use of phosphates, nitrogen, potash, and rotation of crops for dark tobacco soils are discussed as is also the work in the sun-cured tobacco district regarding humus and fertilizers for flue tobacco.

Experiments with dark tobacco, B. G. ANDERSON (*Virginia Sta. Bul.* 206 (1914), pp. 15, figs. 3).—This bulletin records the yields obtained by a six-year rotation from 1908-1913 on Cecil sandy loam, Cecil clay, depleted Cecil clay, and Iredell clay loam in Appomattox County, continuing work in cooperation with the Bureau of Plant Industry of this Department, previously noted (E. S. R., 20, p. 333).

It seems that the fertility of the soil on these types has been fairly well maintained by the rotation followed, and the yields of grass have in most cases increased. Notes are given upon the culture of the crops in the rotation.

The records of fertilizer experiments with dark tobacco and crops grown in rotation with tobacco indicate the value of a formula applying 250 lbs. dried blood, 600 lbs. acid phosphate, and 100 lbs. sulphate of potash per acre. In general, an application of 2,000 lbs. of burnt lime per acre increased the yields of all of the rotation crops, legumes most notably.

Yields of seven varieties of tobacco are given as ranging from 950 to 1,600 lbs. per acre on red clay soil. "The variety Lizard Tail showed superiority in every way including quality, weight, and color in curing."

Nicotin as a by-product of tobacco culture, E. CHUARD and R. MELLET (*Compt. Rend. Acad. Sci. [Paris]*, 159 (1914), No. 2, pp. 208-210).—In a study to determine the most profitable method of handling the tobacco crop to secure the maximum amount of nicotin as a by-product, it was found that in general plants not suckered were not good producers of alkaloids. The yield of nicotin in the individual plant left in the field after the harvest, with the small buds recently formed at the axils of the large leaves, was considerably superior to that of individuals that were completely stripped. An application of nitrate of soda to the stripped plants did not alter the relative composition of the different plant organs, but increased the actual production of alkaloids per plant and favored growth.

Wheat in Alabama, J. F. DUGGAR and E. F. CAUTHEN (*Alabama Col. Sta. Bul.* 179 (1914), pp. 103-124, pls. 2, fig. 1).—This bulletin gives results of variety tests, fertilizer experiments with wheat, and advice to farmers on the production of wheat in Alabama, including data on disease, insect pests, and weeds.

Different varieties show average yields for four years or more varying from 13.6 to 18.2 bu. per acre. The varieties found to be best suited to Alabama conditions were Alabama Blue Stem, Red Wonder, Golden Chaff, Currell, Fultz, and Fulcaster. The protein content of 9 varieties ranged from 11.25 with Alabama Blue Stem to 13.75 with Stoner. Twelve varieties are described.

In regard to plowing under cowpeas and velvet beans, it is noted that "the entire vines of these two legumes afforded a large increase as compared with the weed plat. However, the entire plant in this case proved less valuable in its first year effects than did the stubble of cowpeas and velvet beans. This

was probably because the vines were rather poorly plowed under and left this sandy, loose soil in a condition too loose and open for the best growth of wheat."

Fertilizer experiments have showed that nitrogen is of first importance, phosphorus secondary, and that potash, though often useful, is less important than the other two constituents. Equal amounts of nitrogen applied at planting time proved to be of practically equal value for wheat whether in the form of nitrate of soda, cotton-seed meal, or cotton seed; but nitrate of soda when applied as a top-dressing in March proved much more effective than any other fertilizer.

Wheat and rye of east Siberia, W. A. UGLOW (*Ztschr. Gesam. Getreidew.*, 6 (1914), No. 6, pp. 113-118).—This article discusses the production of wheat and rye and their adaptation to the climatic conditions, and gives tables of analyses of these cereals from the 1910-11 crops of Amur and Primorsk districts.

On the loss in a stack of unthreshed corn, E. J. RUSSELL (*Jour. Bd. Agr. [London]*, 21 (1914), No. 4, pp. 300-303).—The inadvisability of holding wheat unthreshed in the stack is shown in results obtained at Rothamsted. The loss, due chiefly to mice, was 14.7 bu. per acre, or 53 per cent, in holding the stack for 9½ months. In another case a loss of 6.8 bu. per acre, or 20 per cent, occurred in a stack in 6 months.

Grades of grain, C. QUINN (*Toledo, Ohio [1914]*, pp. 16).—Commercial grades of grain, comprising those of wheat, rye, oats, corn, milo maize, Kafir corn, and barley, and the rule for using the testing kettle, are described.

Observations on the eradication of weeds by the use of kainit, T. REMY and J. VASTERS (*Landw. Jahrb.*, 46 (1914), No. 4, pp. 627-657, figs. 5).—In this paper are described 12 experiments in which several kinds of weeds growing with cereals were treated with varying amounts of kainit in different degrees of fineness.

The author concludes that kainit is a serviceable weed killer when used under certain favorable conditions. The first requirement is the application of a sufficient quantity, not less than 1,200 kg. per hectare (1,068 lbs. per acre), and increasing with the age of the weed to a probable maximum application of 2,000 kg. The application must be made on heavy dew or rain-dampened plants, and the best results follow a dry day. Foggy or misty weather after the application retards the action of the kainit and will make the results doubtful. The action of kainit was especially favored by dry or slightly frozen ground, which conditions seems to retard the flow of water to the plant to relieve the plasmolytic action of the kainit. The use of finely ground kainit, evenly distributed, greatly favored its action. The weeds must not be old, and the younger the better were the results.

All kinds of weeds were not equally acted upon by the kainit. Three groups are noted: Sensitive, wild mustard, wild radish, wild buckwheat, chamomile, nettle, groundsel, knapweed, speedwell, chickweed; medium sensitive, smartweed, spurry, tower cress; and slightly sensitive orach, sow thistle, fumitory.

A heavy application of kainit had an injurious effect upon the texture of the soil surface except in the presence of calcium, although the potash in the kainit served for remaining plants or future crops. Cereals were only temporarily injured by the applications. Barley seemed the most easily affected, but soon recovered even with an application of 2,500 kg. per hectare.

The author discusses at some length the action of the various compounds of the kainit in killing weeds. The carnallite was more effective than the sylvanite.

The use of sodium arsenite for killing weeds, J. W. INCE (*North Dakota Sta. Spec. Bul.*, 3 (1914), No. 9, pp. 146, 147).—This article gives some results of methods of preparing sodium arsenite and of preliminary experiments in

spraying with the solution to kill weeds. These results point to the probable efficiency of the formulas used as a weed destroyer.

The plumber's blowlamp as a garden tool, H. E. DURHAM (*Jour. Roy. Hort. Soc. [London]*, 40 (1914), No. 1, pp. 16-18).—This article describes a method of using on a small scale the plumber's blowlamp to destroy weeds and sprouting seeds at the surface of the ground.

HORTICULTURE.

Sap studies with horticultural plants, W. H. CHANDLER (*Missouri Sta. Research Bul.* 14 (1914), pp. 491-552, figs. 13).—In connection with a study of the killing of plant tissue by low temperature (E. S. R., 32, p. 42), freezing-point determinations as well as electrical resistance and molecular weight determinations were made of sap from the cortex of tissue of many different kinds of plants, including orchard fruits as well as flowering plants and vegetables. The determinations were made throughout the winter season and during part of the summer season with the view of detecting possible changes in the sap during the winter that might help to account for the increased hardness of mature winter tissue. Although no changes were found that would explain why plants acquire greater resistance to cold in winter, the data secured in these investigations, as well as those from other sap studies, are here presented for any value they may have in similar investigations.

The data are presented in a series of tables and discussed under the following general headings: Method of making freezing point determinations, determining the electrical resistance, molecular weight determination of plant sap solute, plant density of various tissues of trees, sap concentration at different periods of the year, sap concentration of green and ripe fruit, effect of vigorous growth upon sap concentration, and sap concentration in relation to water movement. A bibliography of related studies is given.

The author's principal deductions from his studies as a whole are presented in the following summary: "A very small proportion of the osmotic strength of leaf and cortex sap as measured by the lowering of the freezing point is produced by electrolytes, except in the leaves of succulent plants. It is also true that generally more than half of the osmotic strength of leaf and cortex sap is produced by neither sugars nor electrolytes.

"The molecular weight of the sap solute varies for different tissues, but for any given tissue it does not vary greatly except in early summer during the period of rapid growth, when it seems to be somewhat smaller than at other times. The molecular weight of the sap solute of twigs from peach trees that have been forced into vigorous growth by pruning seems to be smaller during most of the summer than that of the cortex sap of peach twigs from trees not so pruned.

"During the growing period there is a fairly constant increase in the molecular concentration of the cortex sap from the roots up through the trunk and large branches to the twigs, exceptions to this, apparently, being most common in the trunk. In late winter this greater molecular concentration of the cortex sap in the upper portions of the tree does not generally prevail. The molecular concentration of cortex sap is the smallest during the period of rapid growth. In case of roots, especially, and to a lesser extent in other tissues, the molecular concentration of the cortex sap is not so great during early summer with trees that have been forced into vigorous growth by heavy pruning as with trees not so pruned.

"A molecular concentration as determined by the freezing point seems a fair measure of the condition of nutrition, at least of the roots. The molecular

concentration of the young leaves near the growing point of peach and apple twigs is not so great as that of the old leaves. The molecular concentration of the leaves of fruit trees is generally considerably greater than that of fruit except in the case of some ripe fruits like cherries or currants. Where this difference prevails the leaves are able to remove water from the fruit. There seem to be times in the orchard when the air is very dry and the moisture supply limited when a large foliage may remove the water from the fruit to an injurious extent."

Hotbeds and cold frames, R. A. MCGINTY (*Colorado Sta. Bul.* 199 (1914), pp. 35-40).—This paper contains popular instructions for the care and management of hotbeds and cold frames.

Vegetable growing in Colorado, R. A. MCGINTY (*Colorado Sta. Bul.* 199 (1914), pp. 3-34).—This paper contains popular directions for the culture of different vegetables under Colorado conditions.

Mendelism in melons, D. LUMSDEN (*New Hampshire Sta. Bul.* 172 (1914), pp. 3-58, figs. 20).—The author here reports a study of a portion of the progeny of two distinct types of melons with reference to their inheritance of such characters as form and size of fruit, color of skin, size of seed, ribbing, and netting. The English muskmelon, Sutton Superlative, was used as the female parent and the French cantaloup, *Delices de la Table*, as the male parent. In certain cases crossing was continued through the fifth generation.

Summarizing the work as a whole, the author concludes that the pairs of characters here considered show a blend in the F_1 generation rather than a dominance of one of the characters as determined in Mendel's work with peas [E. S. R., 13, p. 744]. The segregation of dominant and recessive characters occurs in the F_2 generation. The six pairs of characters studied show dominance and recessiveness as follows: Dominant—yellow color of skin, round form of fruit, large size of seeds, ribbing, netting, and large size of fruits. Recessive—green color of skin, obtuse-elliptical form of fruit, small size of seeds, nonribbing, smoothness, and small size of fruits. Seeds of one hybrid having a green skin and of another having a yellow skin were selected for the purpose of ascertaining whether a pure hybrid type had been fixed. The test as continued for two generations proved fixation of type.

Experiments in onion culture, J. W. LLOYD (*Illinois Sta. Bul.* 175 (1914), pp. 337-362, figs. 2; *Abs.*, pp. 4, figs. 2).—This bulletin reports experiments in onion culture which have been conducted at the station for a period of six years.

A test of the effect of using wood ashes in addition to manure as a fertilizer for onions shows that the yield was increased five years out of the six by the use of the ashes. The net value of the increase was sufficient to make their use profitable in only three of the years, but there was an average net profit due to the use of ashes of \$17.46 per acre annually for the six-year period.

In order to test the relative value of early and late planting, four plantings at intervals of 14 days, beginning the latter part of March, were made during the first four years and three plantings in the last two years. The results show, in general, that the period of growth decreased as the date of planting was deferred. Likewise, the shortening of the growth period by late planting had a decidedly unfavorable influence on profitable yield. The average size of the bulbs decreased as the planting became later. However, in addition to the time of planting, the size and yield of onions were also influenced by prevailing weather conditions, there being more differences in the size of onions from the same plat in different seasons than from different plats in the same season.

In order to secure data regarding the influence of thinning on the size and yield of bulbs and the relative cost of growing onions with and without thinning,

tests were conducted for four seasons. After the seedlings had become fully established they were thinned to a distance of approximately 3 in. The results show that thinning has a decided influence on the size of the bulbs. Attempts to grow onions without thinning resulted in the production of a high percentage of undersized bulbs, except when the original stand was comparatively thin.

Larger yields of onions were produced from sets than from seed. The sets are more certain to produce a paying crop than the seed, especially under unfavorable weather conditions. The crop ripens earlier from sets and can usually be disposed of promptly at harvest time. The chief objection to the growing of onions from sets is the amount of labor involved in planting. This appears to be offset by the saving of expense in weeding, thinning, and tillage. The excess cost of sets over seed and the increased labor of harvesting a larger crop from the sets are usually more than balanced by the greater value of the crop. The author concludes that for local markets at least the growing of onions from sets offers greater opportunity for large profits from small areas than growing onions from seed.

Tomato variety and planting tests, T. H. WHITE (*Maryland Sta. Bul.* 180 (1914), pp. 89-102).—In continuation of variety tests reported in 1906 (E. S. R., 18, p. 937) data are here given on tests which have been conducted since that time. In addition to a general variety test, comparison has also been made between certain varieties planted both early and late and the results are here presented in tabular form and discussed.

Tomato culture, J. F. MONROE (*Maryland Sta. Bul.* 180 (1914), pp. 114-134, figs. 11).—This paper contains popular suggestions relative to the culture and management of a tomato crop.

Notes on fruit growing in the East Africa Protectorate, H. POWELL (*Roy. Bot. Gard. Kew, Bul. Misc. Inform.*, No. 8 (1914), pp. 268-273).—Notes are given on the condition and behavior of a large number of fruits being tested at the experiment stations in the East Africa Protectorate.

Fruits: their handling and storage, J. L. HUGHES (*Trans. Amer. Soc. Refrig. Engin.*, 9 (1913, pp. 203-215).—A paper on this subject presented before the American Society of Refrigerating Engineers at their annual meeting in New York, December, 1913.

Handling apples for storage, W. J. YOUNG (*Washington Sta. Popular Bul.* 72 (1914), pp. 8).—This contains popular instructions for handling apples intended for storage. A list is also given of a number of varieties of apples showing their customary behavior under storage conditions.

Preparation of fruit exhibits, R. J. BARNETT (*Washington Sta. Popular Bul.* 71 (1914), pp. 16, figs. 6).—A popular bulletin of information relative to premium lists and rules for fruit exhibits, preparing exhibits, characteristics of show fruit, transportation of show fruit, nomenclature, score cards, district displays, and important points to be observed in exhibiting fruit.

Experiments with small fruits, W. R. BALLARD (*Maryland Sta. Bul.* 182 (1914), pp. 155-179, figs. 4).—The experimental work here discussed deals chiefly with variety tests of raspberries, blackberries, gooseberries, and currants. Suggestions are also given for the culture of the above fruits and also for grapes.

The management of strawberry soils in the Pajaro Valley and its problems, C. B. LIPMAN (*California Sta. Circ.* 122 (1914), pp. 4).—As a result of a preliminary study of the management of strawberry soils in the Pajaro Valley the author here presents a short statement relative to the present methods of management and offers suggestions relative to improvements in methods of soil handling. The study was made primarily to determine what ground there was for the rather common claim that a new crop of strawberries should not

be planted on land which had grown a previous crop of strawberries for three or four seasons.

The author found that some deterioration does occur when a second crop of strawberries is planted. The cause of this deterioration is thus far unknown, but there is no evidence to show that this condition is due to a direct injurious effect of the strawberry plant on the soil. He also found that it was a common practice not to cultivate the irrigation ditches between the rows of strawberries and that this soil became packed and baked during irrigation periods, thus preventing a proper supply of air to the soil. It is recommended that irrigation be less frequent and that the ditches be cultivated deeply with a one-horse cultivator between irrigation. Where one crop of strawberries is to follow another, it is suggested that the land be plowed deeply in the fall and sowed to bur clover or some other legume which will make a heavy winter growth, this cover crop to be plowed under in the spring and the soil prepared for the new planting.

Vine pruning in California, II, F. T. BIOLETTI (*California Sta. Bul.* 246 (1914), pp. 57-108, figs. 51).—In continuation of a previous bulletin discussing the principles of pruning *Vitis vinifera* grapes (E. S. R., 30, p. 741) an account is here given of the principal systems of pruning adapted to California conditions.

A description is first given of an ideal mature vine in full bearing. This is followed by a discussion of methods of handling a young vine to make it approach as nearly as possible this ideal. An account is then given of the regular pruning necessary to make the vine produce maximum crops to a respectable old age, together with a discussion of the renovation of imperfect and misshaped vines. The bulletin concludes with a discussion of the choice of system and lists of varieties adapted for long, half long, and short pruning.

Origin of the date palm, P. POPENOE (*Jour. Heredity*, 5 (1914), No. 11, pp. 498-508, figs. 5).—Notes on the history of the date palm, including a reference to Berry's discovery of fossil fruit and seed in Texas (E. S. R., 31, p. 142).

Maté culture, C. D. GIROLA (*El Cultivo del Mate. La Plata, Argentina, 1914*, pp. 27, figs. 3).—A discussion of yerba maté (*Ilex paraguayensis*) culture, with special reference to methods of reproduction and propagation.

Olive culture, W. J. ALLEN (*Dept. Agr. N. S. Wales, Farmers' Bul.* 82 (1914), pp. 42, figs. 35).—A general treatise on olive culture, oil extraction, and olive pickling, with special reference to the development of the industry in New South Wales.

Further notes on the seedless fruits of the common persimmon (*Diospyros virginiana*), D. M. MOTTIER (*Proc. Ind. Acad. Sci.*, 1912, pp. 67, 68).—This comprises a brief reference to the parthenocarpic nature of seedless fruits growing on persimmon trees on the campus of Indiana University. See also a previous note (E. S. R., 22, p. 340).

Reference is also made to the successful ripening of persimmons by inclosing fully-developed firm fruits in Mason jars and allowing them to remain in a cool place in the basement for from ten days to two weeks. The lids of the jars were screwed on without rubbers. The fruits when removed were soft, juicy, and without a trace of astringency.

Vanilla culture in Madagascar, A. FAUCHÈRE (*Bul. Écon. Gouv. Gén. Madagascar*, 14 (1914), II, No. 2, pp. 122-126).—An account of vanilla culture and the preparation of the beans for market in Madagascar.

Recent experiments in shield budding tropical fruits at the Lamao Experiment Station, P. J. WESTER (*Philippine Agr. Rev. [English Ed.]*, 7 (1914), No. 9, pp. 356-359, pls. 2).—The work here noted deals with the asexual propagation of the durian (*Durio zibethinus*), hevi (*Spondias cytherea*), caram-

bola (*Averrhoa carambola*), bilimbi (*A. bilimbi*), atemoya (E. S. R., 31, p. 47), and cherimoya (*Annona cherimolia*), and the budding of some of the cultivated citrus fruits on the calamondin (*Citrus mitis*).

The experiments carried out during the dry season of 1913-14 have shown that the durian and carambola may be readily shield budded with the inverted T bud. The carambola and bilimbi budded on each other and the bilimbi budded on itself have thus far failed to grow. Atemoya buds well on the mamon but not so well as on the custard apple, which imparts to the atemoya a very characteristic upright growth. The cherimoya and atemoya do not thrive on the soursoy but the cherimoya can be budded on the sugar apple, custard apple, and mamon with good results. Of the Philippine citrus fruits the orange, mandarin, lime, and pomelo have grown well on the calamondin. There is a tendency for the calamondin to dwarf the more robust species grafted upon it. Repeated attempts to graft and bud seedless breadfruit upon the seedling type have failed absolutely. The author has met success in budding avocados and large-fruited guavas.

The improvement of medicinal plants, F. A. MILLER (*Proc. Ind. Acad. Sci.*, 1912, pp. 115-120, figs. 4).—Some preliminary notes are given on selection studies of belladonna, henbane, stramonium, Digitalis, and Cannabis which are being conducted with the view of increasing the percentage of alkaloids. The results, although not conclusive, indicate that not only greater yields but better and more reliable medicinal products can be secured through judicious selection.

Goldenseal under cultivation, W. VAN FLEET (*U. S. Dept. Agr., Farmers' Bul.* 613 (1914), pp. 15, figs. 5).—This describes the goldenseal plant and gives an account of its production and culture, both under lath shed shade and under forest tree shade. Information is also given relative to digging, curing, diseases and pests, yield, and cost.

The author concludes in general that regarded as a minor money crop, goldenseal is well adapted for small growers who can meet the special requirements of the plant. Since goldenseal requires essentially the same conditions as ginseng (E. S. R., 29, p. 639), although easier to grow, it is suggested that it may prove a desirable side or succession crop with ginseng.

Dreer's hints on the growing of bulbs (*Philadelphia*, 1914, pp. 64, figs. 20).—A practical manual of information on the indoor and outdoor culture of bulbs.

The daffodil yearbook, 1914 (*London: Roy. Hort. Soc.*, 1914, pp. IX+140, pls. 37).—A yearbook of information dealing with various phases of daffodil culture, varieties, diseases, insect pests, exhibitions, etc. In addition to information dealing principally with Great Britain, papers and notes from Australia, New Zealand, Holland, and the United States are also included.

Practical help on landscape gardening, W. MILLER (*Illinois Sta. Circ.* 176 (1914), pp. 16, figs. 9).—This circular briefly outlines the assistance rendered to the people of the State by the division of landscape extension of the University of Illinois, and contains instructions for securing illustrated lectures, advice, and plans for home grounds, streets, roads, library, school, and other public buildings.

Luther Burbank, his methods and discoveries and their practical application, edited by J. WHITSON and R. J. and H. S. WILLIAMS (*New York and London*, 1914, vols. 1, pp. 308, figs. 105; 2, pp. 308, figs. 105; 3, pp. 308, figs. 105).—Volume 1 of this work comprises a survey of the breeding methods employed by Burbank, volume 2 gives the history of a number of his productions, and volume 3 deals with various phases of plant propagation, such as pollination, grafting, plant affinities, fixing traits, and selection. The work as a whole was prepared from Burbank's original field notes under the direction of a board of editors.

FORESTRY.

The timbers of British Guiana (*West India Com. Circ.*, 29 (1914), Nos. 400, pp. 34, 35; 401, pp. 54, 55; 402, pp. 81-83, fig. 1; 403, pp. 103, 104; 404, pp. 127, 128; 405, pp. 152, 153; 406, pp. 173-175).—An account of the forests and timber industry in British Guiana, including a descriptive list of the principal woods.

List of the trees, shrubs, and economic herbs of the Southern Forest Circle of the Central Provinces, H. H. HAINES (*Indian Forester*, 38 (1912), No. 10, pp. 495-509; 39 (1913), No. 2, pp. 49-69+3; 40 (1914), Nos. 5, pp. 194-229+3; 6, pp. 264-283; 7, pp. 330-355; 8, pp. 392-403; 9, pp. 429-449; 10, pp. 472-502).—A descriptive list of the economic plants of the Southern Circle of the Central Provinces, containing information as far as could be obtained relative to the nomenclature, botanical characteristics, distribution, and uses of each species.

Ecology of sal (*Shorea robusta*).—I, Soil composition, soil moisture, soil aeration, R. S. HOLE and P. SINGH (*Indian Forest Rec.*, 5 (1914), No. 4, pp. 11+42, pls. 2).—This paper describes the preliminary experiments which have been carried out in the Dehra Dun experimental garden to determine the effect of soil composition, soil moisture, and soil aeration on the development of sal seedlings. The work is being conducted with special reference to the determination of those factors which influence the healthy development of sal trees.

Studies on color variation in black pine seed, PITTAUER (*Centbl. Gesam. Forstw.*, 40 (1914), No. 5-6, pp. 185-202, figs. 4).—A preliminary report on a study of color variation in black pine seed, with special reference to the influence of color on the germinative value of the seed.

Spectrophotometric investigations in woods, H. KNUCHEL (*Mitt. Schweiz. Centralanst. Forstl. Versuchsw.*, 11 (1914), No. 1, pp. 1-94, pls. 3, figs. 34).—The results are here given of a study of the influence of light on the growth and development of individual trees and of stands composed of various species of trees. The data are presented in tabular form and fully discussed.

Annual ring formation and light, OELKERS (*Ztschr. Forst u. Jagdw.*, 46 (1914), Nos. 8, pp. 455-472, pls. 2, figs. 4; 9, pp. 519-538, figs. 4).—The author here reports a study of the two factors, light and heat, as influencing wood accretion in forest stands. A bibliography of cited literature is appended.

Investigations in mixed stands, SCHWAPPACH (*Ztschr. Forst. u. Jagdw.*, 46 (1914), No. 8, pp. 472-491).—A further report on the growth behavior of mixed forest stands as compared with pure forest stands in East Prussia and Silesia (*E. S. R.*, 21, p. 144).

Size and disposition of normal growing stock in seedling forests, P. FLURY (*Mitt. Schweiz. Centralanst. Forstl. Versuchsw.*, 11 (1914), No. 1, pp. 97-148, figs. 20).—The present study of normal growing stock is based on an analysis of yield tables and other yield investigations which have been conducted with different timber species.

Report of the state forest administration of Bavaria (*Mitt. Staatsforstverw. Bayerns*, No. 15 (1913), pp. 165).—A statistical review of forest operations in Bavaria for the year 1912.

The data given show the extent of forest areas of all kinds at the beginning of the year, yield in major and minor forest products, revenues, expenditures, planting operations, forest protection, etc. The results of the felling operations, forest plantings, and other improvements in the forests belonging to communes, institutions, corporations, and estates are included.

Forest products of Canada, 1913.—Pulp wood, R. G. LEWIS and W. G. H. BOYCE (*Dept. Int. Canada, Forestry Branch Bul.* 46 (1914), pp. 17, pl. 1, figs.

3).—A statistical account is given of the quantity and value of pulp wood produced in Canada according to Provinces, species used, and method of manufacture, of the pulp wood exported from the Dominion, and of the imports and exports of wood pulp during the calendar year 1913. The report also contains a map showing the location of the pulp mills of the Dominion.

DISEASES OF PLANTS.

[Report on plant protection in Baden, 1913], C. VON WAHL and K. MÜLLER (*Ber. Hauptstelle Pflanzenschutz Baden, 1913, pp. 70, figs. 5*).—This report is similar in plan and scope to that of the previous year (*E. S. R.*, 31, p. 539).

Several newly proposed treatments tested for *Peronospora* on grapevines proved inferior to Bordeaux mixture for this purpose. Iron sulphate in 20 per cent solution brushed into scab areas on vine stocks was only partially successful in eradicating the scab, which afterwards reappeared.

Fungi parasitic on plants in and near the Province of Turin, 1912, P. VOGLINO (*Ann. R. Accad. Agr. Torino, 56 (1913), pp. 115-138*).—This is a systematic arrangement of the parasites as noted on various plants in this portion of northwest Italy, including more or less discussion in connection with each.

Culture studies with *Uredinae*, 1911-1913, W. TRANZSCHER (*Mycol. Centbl.*, 4 (1914), No. 2, pp. 70, 71).—Results are here sketched of studies carried out on *Puccinia helianthi*, *P. elymi*, *P. perplexans*, *P. isiacæ*, *P. stipina*, *P. permixta*, *P. littoralis*, and *P. opizii*; also on the incomplete fungi *P. simplex*, *P. hemerocallidis*, *P. nitidula*, and a form said to be a variety of *P. stipæ-sibiricæ* and claimed to be a new biological form.

[The stem rot of cereals], L. MANGIN (*Jour. Agr. Prat., n. ser.*, 27 (1914), No. 9, pp. 267-269).—This is a brief review of the history of stem rot or foot rot of cereals and of observations concerning that condition, its causation, and treatment, since about the year 1878. Alternation with nonsusceptible crops, combined with eradication of stubble, later planting with employment of drill seeding, resistant varieties, and drainage, are given as the chief means of avoiding loss from this source.

Grain rusts and their control, E. RIEHM (*Deut. Landw. Presse*, 41 (1914), Nos. 51, pp. 631-633, figs. 3; 52, p. 649, figs. 2).—This is a brief discussion of the life history, injuries, effects, and control of *Tilletia tritici*, *Ustilago hordei*, *U. avenæ*, and *U. occulta* as parasites of wheat, barley, oats, and rye, respectively.

Barley streak disease, H. C. MÜLLER and E. MOLZ (*Deut. Landw. Presse*, 41 (1914), No. 17, pp. 205, 206, fig. 1).—Reporting tests made looking to the control of *Pleospora trichostoma* (*Helminthosporium gramineum*) on barley, the author states that treatment of the seed with a 0.5 per cent solution of copper sulphate was very successful with winter barley. The hot-water treatment of the seed was not uniformly successful as a preventive, but the intermittent plan gave very good results, and a combination of the hot water with the copper sulphate treatment was successful. Formaldehyde was not successful, and the hot-air treatment apparently increased the attack and impaired germinability. Temperature during early stages of growth appears to exert some influence on this disease.

Stinking smut in wheat, H. M. WOOLMAN (*Washington Sta. Popular Bul.* 73 (1914), pp. 8).—A popular preliminary report is given of investigations carried on at the station, in part in cooperation with the Bureau of Plant Industry of this Department, for the control of stinking smut in wheat.

From these experiments it is apparent that the organism may, under certain conditions, be present in the soil and affect the crop in that manner. In treating

seed with copper sulphate, formalin, and copper sulphate to which common salt is added, it was found that the addition of salt to copper sulphate solution materially increased its efficiency. Treatment of seed for 10 minutes in a solution of 1 lb. copper sulphate, 1 lb. common salt, and 5 gal. water, or with a formalin solution, 1 lb. to 40 gal. water, for 30 minutes, is suggested. In either treatment it is recommended that the grain be immersed in an open tank, thoroughly stirred, and the smut balls which float on the surface skimmed off. It is also recommended that treated seed be tested for germination so as to determine the amount to be sown, as machine-threshed seed was found to be severely injured, and such seed, when treated, showed low vitality.

Some studies are briefly outlined on soil treatment to determine the life of the smut in the soil and on times of planting.

A new disease of asparagus, P. VOGLINO (*Ann. R. Accad. Agr. Torino*, 56 (1913), pp. 176-180).—A fungus attacking leaves of *Asparagus officinalis* is claimed to be a new species and is described under the name *Leptothyrium asparagi*.

A fungus disease of hemp, VERA K. CHARLES and ANNA E. JENKINS (*U. S. Dept. Agr., Jour. Agr. Research*, 3 (1914), No. 1, pp. 81-84, pl. 1, fig. 1).—The authors describe *Botryosphaeria marconii* on hemp. The disease was called to their attention in September, 1913, on a variety of hemp grown for experimental purposes by this Department. Although the disease did not make its appearance until the plants were nearly full grown, it was rapid in its action, about two weeks having intervened between the time when it was first noticed and the death of many of the plants. The authors consider the imperfect stage of the fungus identical with that described as *Dendrophoma marconii*, the perfect stage not having been hitherto recognized. The name *B. marconii* n. sp., is given it.

Smut in Kafir corn, I. B. P. EVANS (*Agr. Jour. Union So. Africa*, 7 (1914), No. 6, pp. 811-814, figs. 2).—A description is given of this disease due to *Sphacelotheca sorghi*, with directions for treatments recommended. These include steeping or sprinkling with formalin solution 1 lb. to 30 gal. of water, soaking with copper sulphate 1 lb. to 10 gal. of water, and immersion in water heated to 135° F.

Some diseases of the potato.—II, Black dot disease, ETHEL M. DOIDGE (*Agr. Jour. Union So. Africa*, 7 (1914), No. 6, pp. 879-882, figs. 4).—Continuing previous work (E. S. R., 32, p. 50), the author notes a disease of potatoes not hitherto reported in South Africa and attributed to *Vermicularia varians*. The author prefers the descriptive name black dot disease to that of French potato scab which has been applied to the disease elsewhere.

Preventive measures include burning all diseased plants and the nonuse of suspected tubers for seed and of infected soil for planting either potatoes or tomatoes. It is not yet known how long the sclerotia in the soil may continue capable of spreading the infection.

Potato scab and sulphur disinfection, C. D. SHERBAKOFF (*New York Cornell Sta. Bul.* 350 (1914), pp. 705-743, figs. 2).—The results are given of a series of experiments conducted to determine the value of sulphur for preventing potato scab and its effect on the subsequent crop and on its possible fertilizing value. After a summary review of the literature relating to experiments where sulphur was used for scab control, the author describes in detail his investigations carried on in 1911, 1912, and 1913, unusual precautions having been taken to reduce the experimental error.

As a result of his experiments the author concludes that sulphur treatment of the soil against potato scab, when applied at the rate of from 450 to 900 lbs.

per acre, sown broadcast and thoroughly mixed with about 2 in. of the surface soil just before the potatoes were planted, considerably reduced the amount of scab. In no cases, however, was scab entirely eliminated. When lime was applied at the rate of from 350 to 400 lbs. per acre in conjunction with 450 lbs. of sulphur, the fungicidal power of the sulphur was reduced to practically nothing. Where the same quantity of lime with 900 lbs. of sulphur was used the fungicidal value of sulphur was not reduced, and at the same time its injurious after effect on the crop was considerably diminished.

Sulphur added to commercial fertilizer reduced the value of the fertilizer more or less noticeably, although a small quantity of sulphur, about 100 lbs. per acre on certain soils, was found to have some fertilizing value for potatoes. Where it was used in quantities of over 300 lbs. per acre it seemed to be more or less injurious to the crop. As a rule the effect of sulphur treatment on the potato crop in the succeeding season is that of reducing yield and scab, the scab being reduced more than the yield.

A bibliography is appended.

Powdery scab of the potato, R. P. GORHAM (*Dept. Agr. New Brunswick, Hort. Div. Leaflet 3 (1914), pp. 6, figs. 3*).—A description is given of this disease of potato, with measures recommended for its control. These include the use of only such seed as are known to be free from the disease, as there is no known remedy for potatoes when once infected, the spores remaining virile in the soil for many years.

The Rhizoctonia disease of potatoes, W. J. MORSE and M. SHAPOVALOV (*Maine Sta. Bul. 230 (1914), pp. 193-216, pls. 11*).—Attention is called to the disease of potatoes due to *Rhizoctonia solani* or *Corticium vagum solani*. It is said to be widely spread and lately observed as seriously affecting the potato crop in parts of Maine, where poor uneven stands, low yields, and premature ripening are reported. Field observations and greenhouse experiments have been conducted to learn the nature of the injury and method of control.

In the experiments with fungicides, solutions of corrosive sublimate and formaldehyde destroyed the sclerotia of the fungus. Lime, which has been recommended for its control, was tested in pots with little success. Some observations were made on the liability of varieties of potatoes to the disease, most of the experiments, however, being carried on with the varieties Irish Cobbler and Green Mountain.

While the experiments thus far have shown no definite means of control, the authors recommend seed disinfection with corrosive sublimate solution before planting and rotation of crops, allowing as long a time as possible between successive crops of potatoes.

A bibliography is appended.

A new disease of spinach, P. VOGLINO (*Ann. R. Accad. Agr. Torino, 56 (1913), pp. 377-379*).—The author describes the attack and progress of a parasite on spinach in Savona and in Turin, Italy. The fungus is said to be *Colletotrichum spinaciæ*, which was studied in this connection.

Tomato diseases, J. B. S. NORTON (*Maryland Sta. Bul. 180 (1914), pp. 102-114*).—The author describes a number of tomato diseases, among which the most troublesome are said to be the Fusarium wilt, due to *F. lycopersici* and the leaf blight caused by *Septoria lycopersici*.

For the control of the Fusarium wilt the author thinks the most promising method for relief is the growing of resistant varieties. In a test, about 40 varieties showed marked differences in their susceptibility to attacks of the fungus. In experiments for the control of the leaf blight, practically all varieties grown in this country and Europe have been tested and all showed about the same susceptibility to the fungus attack. Spraying with Bordeaux

mixture was found to reduce the loss, but unless begun early and kept up throughout the season complete protection is not to be expected.

Among the other diseases described are bacterial wilt, mosaic disease, downy mildew, blossom end rot, anthracnose, shedding blossoms, and sunburn.

The author states that the best means of controlling most tomato diseases is to keep plants in strong active growing condition. Attention to this, together with rotation of crops and spraying, it is said, will prevent much loss.

Development of *Cladosporium fulvum violaceum*, M. SAVELLI (*Ann. R. Accad. Agr. Torino*, 56 (1913), pp. 63-66).—Reporting on a study of *C. fulvum violaceum* as related to *C. fulvum* of tomato, these two fungi being very similar externally except in the coloration of the hyphae and of the conidiophores, the author states that infection occurs readily by spores on the upper leaf surface in moderately warm, moist air, the spores germinating quickly and the fungus rapidly making its way among the tissues, disorganizing them and killing the plant. The mycelium produces continually a vast number of secondary spores ready to germinate at once under the conditions usually present in tomato growing. The spores are thought to retain germinability for months in the dead leaves.

A bacterial soft rot of turnips, F. C. HARRISON and W. SADLER (*Proc. and Trans. Roy. Soc. Canada*, 3. ser., 7 (1913), Sect. IV, pp. 91-106, pls. 5; *Ann. Rpt. Quebec Soc. Protec. Plants [etc.]*, 6 (1913-14), pp. 59-72, figs. 15).—The authors describe this disease of crucifers, its cultural characters, progress, and effects as noted in recent studies at the bacterial laboratory at Macdonald College, giving lists of plants attacked by the soft rot organism. This occurs in both wet and dry years. The wet years 1910 and 1912 were characterized by much soft rot, 40 per cent of the turnips being diseased in 1910 on farms in some sections of Canada. Figures seem to indicate a lower degree of susceptibility of the long shaped than of the globe shaped roots. Culture seems to increase the vigor and virulence of the bacterial organism.

A bacterial disease of fruit blossom, B. T. P. BARKER and O. GROVE (*Ann. Appl. Biol.*, 1 (1914), No. 1, pp. 85-97; *abs. in Gard. Chron.*, 3. ser., 55 (1914), No. 1433, p. 420).—This is a preliminary account of the authors' studies on a disease of pears, probably due to a *Pseudomonas*, which may also attack other fruits. The appearance and progress of the disease are marked by a blackening of the sepals or by spots on the floral receptacles and the extension of the discoloration to other parts, large portions sometimes being rendered sterile thereby. Infection is thought to be carried by wind and by insects.

The brown rot canker of the apple, E. S. SALMON (*Gard. Chron.*, 3. ser., 56 (1914), No. 1440, p. 85, figs. 3).—Referring to his previous work (E. S. R., 23, p. 548) on brown rot of apples due to *Sclerotinia (Monilia) fructigena*, the author states that outbreaks have been unusually common during the past autumn and spring, the attack resulting in many cases in the formation of cankers in the branches, proceeding sometimes from the fruit but perhaps more frequently from the blossoms. The attack of several contiguous fruit spurs resulted later in a canker as much as a foot in length. Several varieties observed to have been attacked are named.

Remedies recommended include the cutting out of all affected branches and cankerous spots and spraying with Bordeaux mixture immediately before the flower buds open. For severe cases a second spraying is prescribed, employing Bordeaux mixture, or lime-sulphur wash in case of a sensitive variety. Diseased spurs and branches are said to be dangerous not only to apple trees near, but also to plums and cherries in the vicinity, spores being produced by the fungus during nearly the whole year.

Outbreak of downy mildew in 1913, J. CAPUS (*Rev. Vit.*, 41 (1914), Nos. 1060, pp. 398-403, figs. 2; 1061, pp. 428-433, figs. 2; 1063, pp. 479-483, figs. 3; 1064, pp. 508-513).—The author organized an inquiry, which was carried out in 1913 in several parts of France simultaneously, regarding dates of mildew outbreak, the temporal and successional relations of meteorological phenomena to each phase of evolution of the fungus, the apparent relation of each outbreak to others, and means of control of the causal organism.

Presenting results obtained in descriptive and graphical form, the author states that the general course of the attacks in the various districts was somewhat the same as in 1910, but some differences appeared in severity and in other respects. At least two primary outbreaks occurred in two regions. Secondary attacks are favored by rain, and the lengths of intervals between such outbreaks are affected by the same agency.

Combined treatment for downy mildew, E. ZACHAREWICZ (*Rev. Vit.*, 41 (1914), No. 1054, pp. 237-239).—The author gives explicit directions for a so-called combined treatment, in five applications, for downy mildew in vineyards, which is approved after having been tested under his supervision and having proved its superiority over simple treatments in 1910 and other years of severe attack.

Node canker in grapevines, R. MAIRE and L. TRABUT (*Rev. Vit.*, 41 (1914), No. 1065, pp. 537-541, figs. 5).—The authors describe the effects of a disease attacking grapevines at the nodes. This trouble is ascribed to a fungus held to be a new variety and technically described under the name *Phoma cookei rectispora*.

Root rot of grape, R. BRUNET (*Rev. Vit.*, 41 (1914), Nos. 1065, pp. 533-537, pl. 1, figs. 4; 1066, pp. 561-567, figs. 11; 1067, pp. 589-593, fig. 1).—The author presents the results of studies on several organisms noted in connection with root rot of grapevines, in particular *Dematophora necatrix*, which is discussed in some detail in its various phases.

A preliminary report on raspberry curl or yellows, L. E. MELCHERS (*Ohio Nat.*, 14 (1914), No. 6, pp. 281-288, figs. 5).—Attention is called to the previous note on this disease (E. S. R., 31, p. 545). While the disease is believed to be the same as that described by Detmers, the cause is as yet unknown.

A variety of Cladosporium parasitic on Agave and Echeveria, M. SAVELLI (*Ann. R. Accad. Agr. Torino*, 56 (1913), pp. 112-114).—The author reports a study of a fungus parasitic on the upper leaf surfaces of *A. americana* and of *Echeveria* in Turin. The parasite was at first referred to the species *C. herbarum*, but on being further studied in culture it showed certain characters which led the author to consider it a specialized form, and it was given the name *C. herbarum agave-echeveria*.

The bud rot of coconut palms in Malabar, F. J. F. SHAW and S. SUNDARAMAN (*Agr. Jour. India*, 9 (1914), No. 2, pp. 111-117, pls. 3; *Ann. Mycol.*, 12 (1914), No. 3, pp. 251-262, pl. 1, fig. 1; *abs. in Agr. News [Barbados]*, 13 (1914), No. 322, p. 286).—The authors give a description of the bud rot which has recently become destructive among coconut palms in Malabar.

This disease is said to be due to *Pythium palmivorum*, previously noted by Butler as causing rot entailing serious loss in the case of the Palmyra palm in the Godavari district of India (E. S. R., 24, p. 351), also as attacking coconut palms, though somewhat sparingly, in that region. Infection with spores from pure cultures on wounded or unwounded leaves and leaf sheaths under atmospheric conditions resembling those during the wet season in Malabar succeeded in reproducing effects typical of the disease.

It is concluded from the results of this work that infections upon the external surface of the leaf bases do not take place very readily, but that

infections upon the folded lamina of the central leaf are practically certain to take. Zoospores washed down the leaf may spread infection to deeper portions of the leaf, the disease making rapid progress when the bud is soaked with water.

The only entirely reliable means of checking the spread of this disease is thought to be destruction of trees as soon as infection is evident, though careful pruning has given good results in the drier Godavari district.

A brief bibliography is appended.

A new Rhizosphæra, F. BUBÁK (*Ber. Deut. Bot. Gesell.*, 32 (1914), No. 3, pp. 188-190).—The author gives the new name *R. kalkhoffii* to a fungus found on needles of *Picea excelsa* in Bohemia and France and on *P. pungens argentea* in the Tyrol, and said to have been previously studied by various other authors.

A leaf disease of walnuts, F. A. WOLF (*Mycol. Centbl.*, 4 (1914), No. 2, pp. 65-69, figs. 7).—The *Cylindrosporium* causing walnut blight and inflicting considerable damage in Alabama has been studied by the author and is said to be distinct from other known species. The name *C. juglandis* n. sp. has been given to the fungus, which is technically described.

Destruction of fallen leaves in autumn and use of Bordeaux mixture on the first appearance of the infection controlled the disease.

Heart rot of oaks and poplars caused by Polyporus dryophilus, G. G. HEDGCOCK and W. H. LONG (*U. S. Dept. Agr., Jour. Agr. Research*, 3 (1914), No. 1, pp. 65-78, pls. 2).—According to the authors *P. dryophilus* is widely distributed throughout the United States, being noted to occur in at least 23 States and to attack 29 species of oaks, 3 of poplars, and probably on birch and pine.

Oak Oidium, E. FOEX (*Jour. Agr. Prat., n. ser.*, 27 (1914), No. 11, pp. 333-335).—This is mainly a discussion, partly controversial, regarding the mode of preservation and transmission of Oidium on oak, giving views of several other authors.

Peculiarities of outbreak of oak Oidium, E. NOFFRAY (*Jour. Agr. Prat., n. ser.*, 27 (1914), No. 16, pp. 494, 495).—A reply to the article noted above.

Resistance of oak wood to dry rot in relation to tannic acid, C. WEHMER (*Ber. Deut. Bot. Gesell.*, 32 (1914), No. 3, pp. 206-217, figs. 2).—Reporting and discussing his more recent work with wood of domestic and foreign oaks as related to attack from *Merulius lacrymans*, the author states that in most tests the oak wood proved resistant to the fungus, the exemptions from attack being as previously noted (*E. S. R.*, 27, p. 654), ascribed to the presence of tannic acid. This constituent increases in proportion with the age of the oaks, but very young oak wood is yet to be tested in this connection.

Further germination studies with spores of Merulius, C. WEHMER (*Ber. Deut. Bot. Gesell.*, 32 (1914), No. 4, pp. 254-256, pl. 1).—In continuation of a report previously noted (*E. S. R.*, 29, p. 852), the author states that in later studies carried out with apparently normal spores from pure cultures of *M. lacrymans* on favorable media germination did not take place in 24 days.

ECONOMIC ZOOLOGY—ENTOMOLOGY.

Digest of the game, fish, and forestry laws, edited by J. KALBFUS (*Harrisburg, Pa.: State*, 1913, pp. 320).—This handbook is divided into three parts which contain the text with index of the laws pertaining to game, fish, and forestry.

Notes on mortality of young of wild birds under natural nesting conditions and under artificial or protected states, J. BUTLER (*Rpt. Mich. Acad. Sci.*, 15 (1913), pp. 114-119).—This paper reports upon observations made along

the Rouge River, north of Dearborn, Mich., with a view to noting the mortality of bird life during the nesting period under natural conditions and to compare them later with artificial or protected states, such as in the use of nesting boxes and with their natural and other enemies removed.

They have led the author to conclude that birds have no infallible protective instincts and that evolution is such a slow process that a species is liable to diminish greatly in changing habits to meet new conditions, such as the destruction of forests naturally impose. Those nesting in trees appear, on the whole, to have a better chance than the ground nesters, and those using holes in trees apparently are better off than those nesting outside.

The red-winged blackbird.—A study in the ecology of a cat-tail marsh, A. A. ALLEN (*Abs. of Proc. Linn. Soc. N. Y.*, No. 24-25 (1914), pp. 43-128, pls. 22, figs. 2; *abs. in Auk*, 31 (1914), No. 3, pp. 414, 415).—A report of biological studies of *Agelaius phoeniceus*, conducted in large part near Ithaca, N. Y. The first part of the work (pp. 48-74) deals with the environment, and the second part (pp. 74-126) with the life history and ecology.

"During the greater part of the year the red-wing obtains its food outside of the marsh, and that which it does secure here, is taken, without selection, from the preponderant forms as they occur in succession. Its dependence upon the marsh, or, in other words, the reason for its being a marsh bird, lies in the shelter which it or its offspring receives. . . . It spends hardly more time in the marsh than is necessary to rear its young."

A bibliography of 41 titles is appended.

Sixth annual report of the Quebec Society for the Protection of Plants from Insects and Fungus Diseases, 1913-14 (*Ann. Rpt. Quebec Soc. Protec. Plants [etc.]*, 6 (1913-14), pp. 85, figs. 49).—Among the papers presented in this report are the following: Insects and Disease, by W. Lochhead (pp. 11-21); The Injurious Flea-beetles of the Province of Quebec, by A. Gibson (pp. 25-30); Insects of 1913, by E. M. DuPorte (pp. 38-43; Notes on the Life History and Control of the Bee Moth or Wax Moth, by J. I. Beaulne (pp. 57-59); etc.

The forest insects of central Europe: A text-book and handbook, K. ESCHERICH (*Die Forstinsekten Mitteleuropas. Ein Lehr- und Handbuch. Berlin*, 1914, vol. 1, pp. XII+433, pl. 1, figs. 248; *rev. in Jour. Econ. Ent.*, 7 (1914), No. 4, pp. 350-352).—This volume furnishes a general introduction to the structure and life history of insects and the fundamental principles of practical forest entomology. The several chapters deal with their classification, morphology, internal anatomy and physiology, reproduction, economic importance, natural limitation of insect increase, prevention and control, etc.

Entomological notes, L. H. GOUGH (*Agr. Jour. Egypt*, 3 (1914), No. 2, pp. 103-106, pl. 1).—The notes here presented relate to *Pimpla roburator*, a parasite of the pink bollworm fairly common around Cairo which is thought to have recently taken to preying on *Gelechia* larvæ in Egypt; *Cryptoblabes gnidiella*, a small pyralid moth that has been reared from cotton bolls collected at several points in Egypt; *Ephestia cautella*, a pyralid known as the Kharga Oasis date worm, which feeds on half ripe dates; and the pomegranate butterfly (*Virachola (Deudorix) livia*), the larva of which damages pomegranates and also feeds on dates, sunt pods, and pods of *Acacia edgworthii*.

Common insects of the garden, C. P. GILLETTE (*Colorado Sta. Bul.* 199 (1914), pp. 40-48).—This bulletin contains descriptions of the more common garden insects, together with suggestions for their control.

An efficient and practicable method for controlling melon lice, C. E. DURST (*Illinois Sta. Bul.* 174 (1914), pp. 321-334, figs. 3).—In tests by the station of the more important insecticides during a period of 12 years none has given as satisfactory results as blackleaf 40, work with which has covered 3 years.

It has been found that the melon aphidid can be controlled by applications of this insecticide made with a barrel pump, equipped with a lead of hose, bamboo rod, and nozzle with bent shank and fine cap. At a strength of 1:250 it will not injure melon foliage. A strength of 1:500 or 600 is as effective against the aphidid and is recommended particularly when quick results are desired, while a 1:1,000 solution is practically as efficient and is recommended for use in commercial operations.

"With proper equipment and thorough application, it is possible to kill practically every melon louse on the vines. The material appears to be so destructive to the lice that the finest mist, coming in contact with their bodies, is capable of killing them. When the vines are of medium size, about 200 gal. of solution are required for spraying an acre of 'rowed' melons. Allowing a 1:1,000 solution, the blackleaf 40 for this amount would cost \$2.50.

"Whale-oil soap and tobacco decoction are fairly efficient for controlling melon lice if applied repeatedly, but do not compare with blackleaf 40 in effectiveness or in the ease with which they may be prepared. In the tests at this station, fumigation with carbon bisulphid did not prove to be an efficient or practicable method of controlling attacks of melon lice. Kerosene emulsion can not be used with safety for spraying muskmelons and cucumbers. Homemade lime-sulphur solution injures melon foliage when used as weak as 1:40, and does not control the lice when used as strong as 1:20."

An experiment on killing tree scale by poisoning the sap of the tree, F. SANFORD (*Science*, n. ser., 40 (1914), No. 1032, pp. 519, 520).—It is stated that the cottony cushion scale on a 12-year-old Spanish broom tree, 4 in. in diameter, was destroyed by the author in February by boring a $\frac{3}{8}$ -in. hole to a depth of 3 in. in the trunk and filling it with potassium cyanid. A similar hole bored in an old peach tree and filled with potassium cyanid seemed to increase its vigor.

The Great Basin tent caterpillar in California, E. C. VAN DYKE (*Mo. Bul. Com. Hort. Cal.*, 3 (1914), No. 9, pp. 351-355, figs. 3).—During the summer of 1914 caterpillars of *Malacosoma fragilis* were found in enormous numbers in the territory about Mt. Shasta. The extensive brush areas found on the southern and eastern slopes and to the northeast of the mountain were throughout much of their territory completely defoliated, and presented a brown and seared appearance. The food plants consisted primarily of the thick or broad-leaved *Ceanothus* (*Ceanothus velutinus*), or snow-bush, and *C. cordulatus*. The so-called "squaw carpet" (*C. prostratus*), wild cherry, willow, and many cultivated plants, including the apple, are also attacked by this insect.

Seasonal variation in the common bollworm (*Earias insulana*), G. STOREY (*Agr. Jour. Egypt*, 3 (1914), No. 2, pp. 99-102, pls. 2).—A colored plate illustrating a series of 16 adults which show the natural variation of the species is presented.

Methods for the destruction of the pink bollworm (*Gelechia gossypiella*) in cotton seed, L. H. GOUGH and G. STOREY (*Agr. Jour. Egypt*, 3 (1914), No. 2, pp. 73-95, fig. 1).—The authors describe experiments conducted with mechanical and chemical means for destroying the pink bollworm in cotton.

The different methods that have been found effective and commercially applicable are (1) hot-air treatment, consisting of exposure of the seed to a temperature of between 75 and 94° C. for ten minutes, which did not affect its germination in any way; (2) treatment by poisonous gases, including carbon bisulphid, hydrocyanic acid gas, and sulphur dioxide; and (3) treatment by soaking in cyllin solution 1:1,000 for 24 hours. The first two methods can be employed on a large scale at the time of ginning, the third only immediately before sowing. Treatment is not possible when the seed is in the sacks.

The sugar beet webworm, J. R. PARKER (*Montana Sta. Circ.* 42 (1914), pp. 75-86, figs. 6).—A concise account of *Loxostege sticticalis* and means for its control.

The army worm (*Heliophila unipuncta*), H. T. FERNALD (*Mass. Bd. Agr. Circ.* 22 (1914), pp. 13, pl. 1, figs. 2).—A summarized account of the occurrence of this army worm, its life history and habits, and remedial and control measures. It was particularly abundant in Massachusetts in 1914, especially in the southern part of Plymouth County and in Barnstable, Dukes, and Nantucket counties, reports of its injury having been received mainly from points south of Boston and east of Mansfield.

The biology of the North American crane flies (Tipulidæ, Diptera), I and II (*Jour. Ent. and Zool.*, 6 (1914), Nos. 1, pp. 12-34, pls. 3; 3, pp. 105-118, pls. 2).—Biological and systematic studies of *Eriocera longicornis*, *E. spinosa*, and *E. fultonensis*, are reported by C. P. Alexander and J. T. Lloyd in part 1 of this article, and of *Liogma nodicornis*, by C. P. Alexander in part 2.

Grub eradication, B. H. RANSOM (*Nat. Assoc. Tanners, Tanners Work*, No. 3 (1913), pp. 40).—A paper on the ox warble and its eradication read before the National Association of Tanners at their annual meeting, held at Chicago, on October 31, 1913.

Investigations of the life history of *Hypoderma bovis* and means for controlling it, A. LUCET (*Compt. Rend. Acad. Sci. [Paris]*, 158 (1914), No. 13, pp. 968-970; abs. in *Internat. Inst. Agr. [Rome]*, *Mo. Bul. Agr. Intel. and Plant Diseases*, 5 (1914), No. 6, p. 776).—A report of further investigations of the biology of the ox warble (*E. S. R.*, 31, p. 85).

The number of eggs found in the bodies of four females ranged from 343 to 386. Quite satisfactory results in the destruction of warbles beneath the skin have been obtained through the use of tincture of iodine, pure or diluted (Gram's solution). The injection of 0.5 and 1 cc. of tincture of iodine into 81 swellings in two oxen destroyed all the warbles and their absorption followed.

Relative attractiveness of vegetable, animal, and petroleum oils for the Mediterranean fruit fly (*Ceratitis capitata*), H. H. P. and H. C. SEVERIN (*Jour. N. Y. Ent. Soc.*, 22 (1914), No. 3, pp. 240-248, fig. 1).—The authors report upon investigations carried on in which the attractiveness of various oils was tested, including the vegetable oils (citronella, turpentine, and coconut); animal oils (whale and fish); naphtha distillate (benzin and gasoline); burning oil distillate (kerosene, etc.); and lubricating oil distillate, crude petroleum, etc.

The results are presented in tabular form. They indicate that the attraction of the Mediterranean fruit fly to these oils was confined almost entirely to the male sex. "Female flies were present in these orchards because hundreds were caught by sweeping with an insect net among the fruit trees. Trapping the pest with kerosene was carried on for a period of eight months in the Hawaiian Islands in connection with other experiments and the results show that of every 1,000 fruit flies captured only three on an average were females, the remainder being males."

See also previous notes (*E. S. R.*, 29, pp. 257, 656).

The apple maggot, W. C. O'KANE (*New Hampshire Sta. Bul.* 171 (1914), pp. 3-120, pls. 8, figs. 9).—This is a report of studies of the apple maggot or railroad worm (*Rhagoletis pomonella*) that were started during the summer of 1909 and have been carried on by the author during a period of four years. Preliminary accounts have been previously noted (*E. S. R.*, 25, p. 662).

Following a brief introduction, the author reviews the early history of the pest. He considers it probable that the apple maggot is a native American

species, with one or more species of *Cratægus* as its original food. In addition to the apple, it may attack hybrid crab apples, haws (*Cratægus* sp.), huckleberries, and blueberries.

It is shown that its present known distribution approximates in general the limits of the eastern or humid part of the Transition Life Zone; in other words, the so-called Alleghanian Zone. It reaches its greatest abundance and destructiveness in Maine, in New Hampshire, parts of Vermont, in Massachusetts, parts of Connecticut, and New York, with an additional wide, though scattering, distribution in Ontario, Michigan, and Pennsylvania. It is also present in Canada—in Nova Scotia, New Brunswick, and Quebec. An account given of its occurrence in the United States is based upon correspondence with state and station entomologists.

Its economic status in New Hampshire is next dealt with at some length in connection with a questionnaire in which 210 replies were received from fruit growers who represented practically all sections of the southern two-thirds of the State. The factors influencing comparative infestation are season of ripening, aroma, and thickness of skin; location is an indirect factor. Of twelve varieties of which the most reports relating to infestation were received, six were summer or fall fruit, and of these, five varieties, namely, the Porter, August Sweet, Pound Sweet, Hubbardston, and Early Harvest, are notoriously severely attacked.

Life history studies based upon the work at one or more of three places in the vicinity of Durham are reported. They deal with the dates of emergence of the adult, influence of temperature and moisture on rate of emergence, oviposition, choice of varieties for egg laying, number of egg punctures per apple, period during which eggs are laid, length of the life of the female, dispersion habits of the adults, etc. The studies have failed to give evidence of the occurrence of a second brood in the State. The emergence of the adults begins the last of June or the first week of July, is at its maximum in the second and third weeks of July, and is practically at an end by the middle of August. Oviposition may begin in less than a week after emergence, commencing the first or second week of July and proceeding until the latter part of September. From five to seven days are passed in the egg stage. The larval stage may be passed in 30 days or less, or may be greatly prolonged. The duration of the pupal stage is widely variable, the species exhibiting both a 1-year and a 2-year life cycle. In the 1-year cycle the pupal stage occupies approximately 300 days. A proportion of the early as well as the late-maturing larvæ may require an extra year for the pupal stage. Technical descriptions of the several stages are included.

Under control measures the author discusses poison bait spraying, relation of codling moth sprays, and poison trap pans as measures directed against the adults; control by picking up drops and the use of live stock to keep the drops cleaned up as measures directed against the larvæ; and the use of poultry, use of chemicals in the soil, burying pupæ by plowing, compacting the surface soil, and cultivating the soil as measures directed against the pupæ. "Poison bait sprays, in three years' extended trials in New Hampshire, have entirely failed to insure satisfactory protection of fruit from attack by the maggot. With five or more applications the apples often show abundant egg punctures. Even with ten applications the fruit may be worthless. The adults are not materially attracted to the bait, as so far devised, and are not poisoned in sufficient numbers to render the treatment a definite benefit in the absence of other measures of control." "Emergence of adults can not be prevented by burying the pupæ by plowing, or by cultivating the soil; and probably not by compacting the surface."

It is recommended that in the control of the apple maggot attention be directed especially toward infested early varieties of apples. It is pointed out that the life economy of the maggot is essentially adapted to early types of fruit, the larva requiring a mellow pulp to reach maturity. This is readily available in the drops of soft, summer varieties, while winter fruit, especially the hard, late-maturing type, is not adapted to the needs of the maggot. Mid-summer drops of such fruit are likely to mellow sufficiently for the purposes of the larva, but in general few of the maggots that may be in winter fruit are likely to reach maturity. Infestation of such fruit is often due to flies from neglected earlier varieties nearby. In any fruit the very early drops, falling in June, offer no danger. Drops that fall after the end of September are not apt to mellow sufficiently for the maturity of the larvæ, the critical time being limited to the two months period, from mid July to mid September. The prevention of infested fruit from decaying on the ground is the most important step and is an efficient check; in fact, it is the only known measure that in itself is definitely effective. This end may be accomplished by picking the infested fruit before it ripens sufficiently to fall, by collecting the drops by hand, or by making use of live stock to gather up the drops.

"The frequency with which the drops should be collected depends on the variety of apple. With the earliest and softest of summer fruit, drops should be collected twice a week. This applies to apples of the type of Early Harvest. With early varieties of somewhat firmer flesh, such as Red Astrachan or Sops-of-Wine, once a week is sufficient. This also applies to the softer fall apples, such as the Porter. Later varieties may safely be collected once in two weeks, or longer with hard, winter fruit. With this schedule very few maggots in the apples will be able to leave the fruit and enter the soil for pupation. A reasonable rule to follow, whatever the variety, is not to permit infested apples to grow mellow or soft on the ground. . . .

"Any apples trees worth the space they occupy should be sprayed. The ordinary spraying for codling moth and for apple diseases is of indirect help in efforts toward control of the maggot because such spraying tends to reduce dropping of the fruit. Wild apple trees in the vicinity of the orchard should be grafted over to fruit of value or cut down. Usually they are infested with the maggot, as well as other apple pests, and their presence is a source of constant danger. The possible complication that may be offered by adjacent blueberries attacked by the apple maggot remains to be worked out. If such fruit is found infested close by, it should be removed and destroyed. . . . If winter fruit shows attack by the maggot on picking it should be disposed of promptly, or placed immediately in cold storage. Sent at once to cold storage it may be expected to keep fairly well. In no case should such apples be allowed to remain in the orchard or barn for a period after picking. Such practice is likely to result in rapid deterioration of the fruit."

A bibliography of 66 titles is appended.

Larch killed by a longicorn beetle, B. B. OSMASTON (*Quart. Jour. Forestry*, 8 (1914), No. 4, pp. 277-279, fig 1).—*Tetropium gabrieli crawshayi*, which does not appear to have attracted the notice of foresters up to the present time, has recently been found to be the source of considerable damage in larch woods in several localities in England.

The eggs are deposited in crevices in the bark of sickly larch trees of from about 6 in. in diameter upward. The eggs are laid in June and hatch in about two weeks. During July and August the larva devours the soft bast and cambium layers, penetrating 2 in. or so into the wood before forming its pupal cell, where it lies until early in April when it pupates finally, emerging as an

adult in May. The tree is quickly killed and some damage done to the outer layers of the wood, but chiefly to the sapwood.

Otiorhynchus sulcatus on the island of Oléron, J. FEYTAUD (*Bul. Soc. Études et Vulg. Zool. Agr.*, 13 (1914), Nos. 1, pp. 7-14, figs. 3; 2, pp. 21-25; 4, pp. 53-55; abs. in *Rev. Appl. Ent.*, 2 (1914), Ser. A, Nos. 4, pp. 229, 230; 6, pp. 360, 361).—This article deals with *O. sulcatus*, its natural enemies, and remedial measures. It is a vineyard pest that was first observed on the island four years ago and has since spread in all directions. The larva attacks the roots and the adult damages the vines by attacking the shoots and arresting their development. Collection by hand at night from shelter traps is considered the simplest method of combating them.

The alfalfa weevil (*Phytonomus posticus*), W. O. ELLIS (*Washington Sta. Popular Bul.* 70 (1914), pp. 4, figs. 4).—A brief descriptive account of this pest and of control measures.

On *Eurytoma amygdalis* which injures plums and apricots in the Government of Astrakhan, V. N. RODZIANKO (*Abs. in Rev. Appl. Ent.*, 2 (1914), Ser. A, No. 6, pp. 348, 349).—An account of the biology of this chalcidid and the injury which it causes.

The eggs are deposited in the young fruit and the larva lives inside the stone, feeding on the unripened kernel, which it usually destroys. The attacked fruits fall off, either when still green or not half mature, though some may ripen and can not be distinguished from healthy fruits.

As remedies the collection and destruction of prematurely fallen fruits and the prevention of oviposition are recommended. The collection of immature fruit alone, however, can not be considered adequate as the larvæ sometimes inhabit mature fruits.

Description of two braconids parasitic on *Earias*, G. C. DUDGEON and L. H. GOUGH (*Agr. Jour. Egypt*, 3 (1914), No. 2, pp. 108-110, pls. 2).—*Rhogas kitcheneri* and *R. lefroyi*, two parasites of the Egyptian bollworm, the former also parasitic on the date worm (*Ephestia cautella*), are described.

The common red spider or spider mite, H. E. EWING (*Oregon Sta. Bul.* 121 (1914), pp. 3-95; pl. 1, figs. 38).—This is a monographic account of the common red spider or spider mite which the author shows to be specifically identical with the common European form (*Tetranychus telarius*). It is shown that *T. telarius*, *T. bimaculatus*, and *T. gloveri* should be regarded as synonymous and that *T. sexmaculatus* should be considered as only a variety of *T. telarius* since it apparently differs from the latter, not structurally, but only in size and to some extent in color and habits. Through the employment of the characters of the male genital armature the author has also demonstrated that two separate species, which have been considered in the past as synonymous with the common spider mite, occur in the Western States, namely, *T. flavus* and *T. weldoni*.

In reporting life history studies of the species reference is made to the observations of Perkins in Vermont (*E. S. R.*, 9, p. 859), Morgan in Louisiana (*E. S. R.*, 9, p. 1065), Worsham in Georgia (*E. S. R.*, 25, p. 562), McGregor in South Carolina (*E. S. R.*, 27, p. 264), and Parker in California (*E. S. R.*, 29, p. 261).

Sixty-three eggs, deposited between October 7 and 25, was the largest number obtained from three mites under observation in October, although Worsham has recorded 94 as having been deposited by a single female. The species reproduces parthenogenetically, but the progeny of the virgin females are always of the male sex. In observations of the incubation period of the egg 8 days was found to be the maximum, 3 days the minimum, and $5\frac{1}{2}$ days the average. The larval stage covers an average active period of $2\frac{3}{4}$ days and a quiescent period of $1\frac{1}{2}$

days. The larva apparently does not spin a web, but will be found on webs spun by the adults. The time passed in the first nymphal stage (protonymph) averaged $3\frac{1}{2}$ days during the last of September and early October, it being divided into an active feeding and a quiescent period. The protonymphs are active feeders and their habits are similar to those of the larva. During early October the second nymphal stage (deutonymph) averaged $3\frac{1}{2}$ days. The deutonymphs have the ability to spin webs and pass an active and a quiescent period. The average preoviposition period is $3\frac{1}{2}$ days, while the average obtained for the entire adult stage during early October was $21\frac{1}{2}$ days.

Notes on the general biology of the spider mite which follow deal with the spinning process and use of the web, average length of life period, embryonic development, molting process, parthenogenesis, sex ratios, time and method of copulation, and methods of dispersion. A somewhat extended discussion of color pigments and color variation is presented in which it is shown that casual observations have been very misleading in regard to color variations. The author has obtained all the common color variations among the first and second generation descendants of a single female. Five of these individuals are represented in colors.

In reporting studies of the distribution of the spider mite tables are presented which show its host and geographical distribution in the United States. The species has at present almost a world-wide distribution. Among the regions in the United States that are probably free from general infestation, the author mentions the Great Plains region between the Rocky Mountains and the eastern part of the Dakotas, Nebraska, Kansas, Oklahoma, and Texas. This region is chiefly occupied either by native grasses or by field crops that are not known to be hosts of the red spider. A list is presented which shows that the plants that have been most frequently reported as attacked in this country are, in order of the number of records obtained for each, as follows: Rose, hops, beans, violet, cotton, strawberry, and tomato.

The injury due to the spider mite is caused by its puncturing the tissues of the leaves from the underside and withdrawing the liquid contents of the leaf cells. Following the primary injury there is a change of color in those parts of the leaves most severely injured, the change usually being simply a paling effect, but there may be some reddening of the leaves, the leaves finally shrivelling and dying.

Among the more important natural enemies mentioned are an acarid (*Seius pomi*), which in Oregon is perhaps the most efficient of any of the natural enemies of the red spider; a predaceous thysanopteran (*Scolothrips sexmaculatus*); the insidious flower bug (*Triphleps insidiosus*); a neuropteran (*Conventzia hageni*); two lacewings (*Hemerobius pacificus* and *Chrysopa californica*); a cecidomyiid (*Arthrocnodax occidentalis*), the larva of which is predaceous, which is one of the most important enemies and perhaps the most widely distributed of all; a rove beetle (*Oligota oviformis*) which occurs in citrus districts of southern California; and several coccinellids, namely, *Stethorus picipes*, *S. punctum*, *Scymnus nanus*, and *S. marginicollis*. A number of other probable enemies are noted.

Control measures are dealt with at length. Under cultural methods, the author discusses clean culture, removal of infested plants, pruning and stripping of leaves, trap crops, time of planting, rotation of crops, etc. Fumigation, banding, and spraying are then taken up. It is pointed out that preventive measures are more important and practical than remedial measures. The importance of the destruction of useless host plants, especially those which remain green during the winter, is emphasized. Clean culture is the most important

procedure with field and truck crops and usually will prevent serious infestation, although there are some exceptions to the rule.

"Crop rotation promises to be a good procedure in certain instances, although much care should be exercised in selecting a crop that either matures early in the season before serious mite attacks or is quite resistant to the mites. Trap crops, banding, and irrigation are of questionable value. Fumigation is not effective. This appears to be due to a general resistance of arachnids to poisonous gases which is correlated with the difference in their system of respiration, from that of insects and some of the other arthropods. Spraying in general, while it will kill a large percentage of the mites if properly done, will not give as satisfactory results as it will with most insects. It is especially troublesome as it must be done in the heat of the summer, and is expensive since two applications must be made. Dry sulphur has a very limited use on account of dependency upon weather conditions for effectiveness. Nicotin and emulsion sprays are preferable to the sulphur and lime-sulphur sprays. The latter are at times of questionable value. Adhesive sprays will not always give success; they probably are effective under certain local conditions. The free use of water as a spray is to be recommended, as it knocks many mites from the leaves, so injuring them that they do not return; it lowers the temperature and in this manner reduces the rate of reproduction among the mites; it checks migrations; and finally, it favors the multiplication of predaceous mite enemies. The painting of sulphur on the steam pipes in greenhouses, and the throwing of handfuls of sulphur in the crotches of trees, although both are practices time honored and entrenched by custom, should not be followed. They are useless and expensive and give no relief from mite attacks."

A bibliography of 61 titles is appended.

[Spraying tests of insecticides upon potatoes], J. W. INCE (*North Dakota Sta. Spec. Bul.*, 3 (1914), No. 9, pp. 147-151).—This is a report of a preliminary series of potato spraying tests with insecticides, fungicides, and "stickers." There were 150 small plats of potatoes under observation, all sprays being applied four times, about two weeks intervening between sprayings during the season. The results are dealt with under the headings of (1) adhesiveness, (2) effect upon the plant, (3) effect upon insects, (4) effect upon blight, (5) effect upon maturity, and (6) effect upon yield.

"Lead arsenate and zinc arsenite were shown to be greatly superior to Paris green in the power of adhering upon the plant. There was also an apparent increase in sticking power produced by the addition of soap and glue and the carbonates of either iron, lead, or zinc. Even slaked lime and flour seems to increase the adhesive property of sprays. . . . It was shown in a very striking manner that sulphur sprays are not satisfactory for potatoes. In every case where lime-sulphur, 'soluble sulphur,' and 'sulfocide' were used in combination with the arsenicals, the foliage was badly burned at every application and the plants never fully recovered. The sulphur compounds with Paris green seemed to be even more caustic in their action upon the plants than with the lead arsenate. . . . With a few exceptions the beetles invariably avoided the arsenical sprayed plants and the slugs which started to work upon the vines were very few in number and quickly killed. From the tabulated data it would seem that certain fungicides, as lime-sulphur, and the carbonates and hydroxids of zinc, copper and manganese, exerted a repressive action upon the slugs. . . . The combination of arsenicals and fungicides seemed to be quite effective in prolonging the life of the vines."

Preparation of nicotin extracts on the farm, W. B. ELLETT and J. T. GRISSOM (*Virginia Sta. Bul.* 208 (1914), pp. 3-16, fig. 1).—The investigations

here reported were made with a view to discovering whether the home preparation of nicotin sprays is practicable. A study made of the analytical methods is also briefly reported upon.

In analyses made of tobacco leaves, stems, and sweepings it was found that the nicotin content of stems did not fall below 0.48 per cent and was not above 0.609 per cent. Analyses of leaves of Virginia tobaccos gave a variation of from 2.47 to 5.63 per cent nicotin. Analyses made of seven different nicotin preparations are also reported. The results of laboratory work showing the results of different methods of extraction follow:

"It was found that by soaking the material overnight 70 per cent of the nicotin of sweepings was extracted, while by soaking overnight and bringing to boiling, 78 per cent was extracted. However, the yield of juice was diminished by cooking, so that by heating to boiling, cooling, and straining, only 68 per cent of the nicotin was available. Practically the same results were obtained with stems as with sweepings. The stems would take up about 25 per cent of the water added to make the extract, and this diminishes the yield accordingly. . . . It was found that by soaking 24 hours, 78 per cent of the total nicotin was extracted, and that from 50 gal. of water used 38½ gal. of juice were obtained. . . .

"At current prices for tobacco stems, sweepings, and damaged tobacco, nicotin extracts can be made on the farm more economically than they can be purchased. The chief difficulty is the impossibility (without chemical analysis, which is impracticable on the farm) of standardizing the extract, that is, always making it at a certain definite strength or percentage of nicotin, since the nicotin content of tobacco varies according to the variety, soil, method of curing, and other factors. The experiments show, however, that for all practical purposes tobacco decoctions can be made on the farm that are near enough to the desired strength, since an excess of nicotin in the spray does not injure the plants. . . . Laboratory experiments showed that the home prepared tobacco decoctions gave equally good results for killing plant lice as the proprietary extracts. . . . When tobacco stems cost \$20 per ton, a homemade tobacco spray for aphids will cost about \$1 per 100 gal., as compared with \$1.20 for blackleaf 40, and the stems are worth about \$10 per ton for fertilizer after their nicotin is extracted, since they still contain all the phosphoric acid and most of the potash originally present."

FOODS—HUMAN NUTRITION.

Minnesota wheat investigations.—Series III, composition and quality of spring and winter wheats, crops of 1912 and 1913, C. H. BAILEY (*Minnesota Sta. Bul. 143 (1914), pp. 58, figs. 3*).—This bulletin reports the results of investigations of Minnesota wheats which were carried out in continuance of those previously reported (E. S. R., 29, p. 262). In these investigations studies were made of the hard winter and spring wheat crops of 1912 and 1913. Analyses and studies of the milling quality of the wheats and of the baking qualities of the flour produced from them were made for the purpose of comparing different types and varieties of wheat grown under varying conditions and to study the relation between environment and composition and quality of the wheats. The results of this investigation may be summarized briefly as follows:

"The average quality of the spring wheat samples of the crop of 1912 was inferior to that of the crop of 1911 so far as protein content and baking strength were concerned. The kernels were plumper, however, and yielded higher percentages of flour. The samples of the 1912 crop grown in the northwestern section were generally superior in baking quality to those grown in the same

section the preceding year, and in this regard averaged higher than those from the other sections of the State. The samples from the central section averaged lowest in baking quality, followed closely by those from the southeastern section.

"The average baking quality and protein content of the spring wheat samples of the crop of 1913 were about intermediate between those of the two preceding crops. The relative plumpness, accompanied in most instances by a relatively dense endosperm, resulted in a higher average yield of total flour. The difference in the average baking quality of the flours milled from wheats obtained from the several sections of the State was slight. The samples grown in the southwestern section were poorest in that regard, while those from the western, northwestern, and eastern sections averaged about the same.

"The winter wheat samples of the crops of 1912 and 1913 were inferior in baking quality to the spring wheats grown under the same conditions in almost every instance. The difference was less in the crop of 1913 than in that of 1912. Many of the winter wheat samples were decidedly poor in quality, while others were equal to the average of the hard spring wheats.

"The variations in the composition and quality of wheat of the same varieties and types grown in different seasons, or in different localities the same year, are attributable principally to varying climatic conditions rather than to the fertility of the soil.

"The bearded spring or velvet chaff wheat samples tested were slightly inferior on the average to the bluestem samples with which they were compared, so far as baking strength was concerned. In many instances individual samples were superior to the average of the bluestem samples. On the other hand, the Marquis wheat samples were, in most instances, superior to the bluestem samples, and, it is therefore concluded, to the bearded spring wheats as well. Instances, however, have been noted where these relations did not prevail.

"Bearded Bluestem or Humpback wheat was decidedly inferior to wheat of the other types grown in this State, and in no instance of good baking quality."

Hard red spring wheats from the demonstration farms.—Studies of wheat quality under North Dakota conditions, W. L. STOCKMAN (*North Dakota Sta. Spec. Bul.*, 3 (1914), No. 9, pp. 129-140, figs. 4).—This article discusses factors that seem to influence the milling and baking qualities of wheat grown on about 25 demonstration farms as studied by the station in cooperation with the Office of Grain Standardization of this Department. Topics taken up include the influence on quality of climate, temperature, moisture, yield per acre, crops grown with wheat the preceding crop, and manure. The findings are summarized as follows:

"Differences in temperature alone produce some differences in quantity of wheat but very little in quality. Moisture conditions determine largely the relative yield per acre, composition, and baking strength variations. They determine what parts of the plant shall mature. The larger quantities of moisture at maturity produce on the average higher yields per acre, lower percentage of protein, higher milling yields, but lower baking strength. In this State the percentage of protein and soil nitrogen do not parallel each other. The higher yielding wheats have relatively less baking strength, but produce more flour than those yielding less. The baking strength follows protein content fairly well, except that with the extreme low yields under dry conditions the baking strength suffers. Differences in flour yield are usually differences in quantities of patent flour. Years of low state production are years of relatively high baking strength. Difference in yield on adjacent fields with similar climate and general conditions produce but very little difference in quality.

"Crops grown with wheat (clover and timothy especially) consume part of the moisture and produce wheat of lower milling quality but of slightly

higher baking strength. Wheat does not yield as much under such circumstances as in other demonstration farm rotations. The composition of wheat as well as the quantity, is affected by rotation of crops. Wheat tends to have higher protein content after clover than after cultivated crops and higher after the latter than after small grain. Under the present farm conditions a large quantity of nutrients removed one year does not necessitate a lower production the year following. There is a natural tendency for some plats to be regularly more efficient than others. Manure accompanies the very low and the high yields. The relative baking strength is higher, diminishing with the length of time after the application. The reverse is true regarding the milling yield of flour."

Further data on the use of calcium in bread making, EMMERICH and LOEW (*Ztschr. Gesam. Getreidew.*, 6 (1914), No. 5, pp. 97-99).—The authors give additional reasons for their contention that the addition of calcium in bread making is desirable. See also a previous note (E. S. R., 31, p. 860).

Some edible fishes of Chile with a description of the new species, C. E. PORTER (*An. Soc. Cient. Argentina*, 77 (1914), No. 3-4, pp. 185-210, pl. 1).—A digest of biological and other data with many references to original sources.

Canned corn (*Lab. Inland Rev. Dept. Canada Bul.* 285 (1914), pp. 17).—None of the 205 samples of canned corn examined showed saccharin, but sulphites in more than traces were found in about 25 per cent of the samples. The can contents were uniform in weight, approximating 20 ounces.

One of the questions considered is the use of starch in the packing liquid. In respect to this the author states that he is "unable to discover any intention to defraud the consumer, in this practice. The starch commonly employed is that natural to the corn itself. In the light of present knowledge no further comment upon this feature can be usefully made."

The opinion of the United States Board of Food and Drug Inspection, however, with reference to such use of starch is quoted, to the effect that starch may be added to sweet corn in a manner whereby inferiority is concealed or water is added, this being deemed clearly a violation of the United States Food and Drugs Act.

The value of corn oil as a substitute for olive oil and cotton-seed oil, B. E. POOL and L. E. SAYRE (*Trans. Kans. Acad. Sci.*, 26 (1912), pp. 41, 42).—This study of corn oil was undertaken chiefly with reference to its use in various medicinal preparations in which the other oils are used.

From their experimental work the authors conclude that corn oil has very similar properties to cotton seed and olive oils, and that it resembles them closely in appearance. They recommend that its use for certain medicinal preparations be recognized, since this would be economical and would also increase the market for this cheap and valuable oil.

Analyses of honey, H. KRETZSCHMAR (*Ztschr. Untersuch. Nahr. u. Genussmit.*, 28 (1914), No. 2, pp. 84-89).—A large number of analyses of honeys of different years and of different types are reported.

Improvement in the commercial supply of spices and its cause, L. E. SAYRE (*Trans. Kans. Acad. Sci.*, 26 (1912), pp. 43-46).—The author reports results of examinations of samples of cloves and allspice made by J. F. King under his supervision. From a discussion of these and figures previously published he concludes that since the enactment of the pure food laws few samples of these spices on the market are adulterated, whereas formerly the majority of them contained much foreign material. He believes that the same statements may be made with regard to black pepper.

A new physical method for lessening the harmfulness of coffee, A. SCHENK and J. GÖRNING (*Ztschr. Offentl. Chem.*, 20 (1914), Nos. 11, pp. 202-216, 12, pp.

222-229).—The results of studies of coffee quality as affected by handling are reported. The author treats the coffee beans with finely powdered clay, such as is used in porcelain manufacture, to remove any oil present on the surface of the coffee bean. Such treatment, he believes, improves the quality and lessens disturbance which some persons experience after drinking coffee.

[Food and drug examination and inspection of food establishments], E. F. LADD and ALMA K. JOHNSON (*North Dakota Sta. Spec. Bul.*, 3 (1914), No. 8, pp. 105-128).—In this bulletin are given the results of a sanitary inspection, including the score-card rating, of a number of places where foods and food products are prepared, stored, and sold, together with analytical data regarding a number of samples of milk, ice cream, food preparations, and drugs.

There is also included a report by L. A. Congdon of an investigation of commercial fruit jellies. Analytical data are given regarding 19 so-called pure jellies of which 8 were found to be pure. Special attention was given to the detection of the presence of added acids and the use of apple base as a jellying agent without a declaration of its presence.

Hints are also given regarding the varnishing and finishing of woodwork which are of interest to the housewife.

[Food inspection and analyses], E. F. LADD and ALMA K. JOHNSON (*North Dakota Sta. Spec. Bul.*, 3 (1914), No. 11, pp. 169-200).—This bulletin contains a report of the sanitary inspection of dairies, meat markets, bakeries, grocery stores, restaurants, etc., in a number of cities in the State, together with the score-card ratings of such places. The results are also given of the inspection of a number of samples of milk and other food products made in connection with the above inspection.

[Food and drug inspection and analyses], E. F. LADD and ALMA K. JOHNSON (*North Dakota Sta. Spec. Bul.*, 3 (1914), No. 10, pp. 153-168).—This bulletin contains a digest of data regarding the general sanitary inspection of bakeries, meat markets, and slaughterhouses. The results of the sanitary inspection of a number of places where food is prepared and sold are given, together with score-card ratings. Analytical data are also given regarding the examination of a number of samples of food and drug preparations, and the text of a patent-medicine law for the Philippines.

The work of the chemical inspection department of Dresden for the year 1913, A. BEYTHIEN and H. HEMPEL (*Pharm. Zentralhalle*, 55 (1914), Nos. 17, pp. 389-395; 18, pp. 414-420; 19, pp. 438-444; 20, pp. 462-467; 21, pp. 485-491; 22, pp. 511-517).—In addition to other information data are reported regarding the examination of a number of breads and other bakers' goods and of other food products.

1001 tests of foods, beverages, and toilet accessories, H. W. WILEY (*New York, 1914, pp. XXVIII+249, pl. 1*).—This volume, arranged by Anne L. Pierce, contains an introduction, The Pure Food Battle, Looking Backward and Forward, a Key to Method of Rating Products, and a classified list of the results of testing foodstuffs, beverages, and cosmetics, with comments on quality. A full index is provided.

Available food supplies, J. F. LYMAN (*Pop. Sci. Mo.*, 85 (1914), No. 2, pp. 180-183).—A discussion of the foodstuffs available at the present time and in the future.

Prices of foodstuffs on the Bern market since 1878 and especially from 1910-1913 (*Mitt. Kanton. [Bern] Statist. Bur.*, No. 1 (1914), pp. 93).—This article shows the changes in the price of cereals, meats, fruits, vegetables, and other foodstuffs by months for 1910-1913 and by years for 1878-1913. Between 1887-88 and 1912-13 the greatest relative change took place in the different

meat products and the least in the cereals. The prices of practically all the products mentioned in this report showed an increase.

A study of Chicago's stockyards community.—III, Wages and family budgets in the Chicago stockyards district, J. C. KENNEDY ET AL. (*Chicago: Univ. Chicago, 1914, pp. 80*).—This study of the Chicago stockyards community was carried on under the direction of the Board of the University of Chicago Settlement. The results are considered in connection with wage statistics from other industries employing skilled labor. Many nationalities were represented. Of the 184 families 88 were Polish and 68 were Lithuanian. Quotations from the summary follow:

"One hundred and thirty-one families rented their quarters. The average rental per family was \$107.83, or 13.2 per cent of the total expenditure. One hundred of the 131 renting families occupied flats of four rooms. The 68 Lithuanian families had on an average 4.12 lodgers per family. In one case 13 people were crowded together in four small basement rooms.

"The average expenditure for foodstuffs and liquors was \$441.83 per family, or 53.62 per cent of the total expenditure [the amount expended for alcoholic liquors being 4.42 per cent of the total expenditures in 180 families using it].

"The minimum amount necessary to support a family of five efficiently in the stockyards district is \$800 per year, or \$15.40 per week."

Workingmen's family budgets for seventy families in Holland (*Soc. Democrat. Studie-Club Amsterdam Rap. 69 [1912], pp. 112*).—This investigation was made by the Social-Democratic Study Club of Amsterdam. The methods followed in this study are described and the results reported and summarized. Expenditure for food was one of the subjects considered.

The statistical study of dietaries, a reply to Professor Karl Pearson, D. N. PATON (*Biometrika, 10 (1914), No. 1, pp. 169-172*).—In reply to the criticism previously noted (*E. S. R.*, 30, p. 560) the author points out that no matter what the statistical knowledge, it can not be applied without a knowledge of the subject matter, in this case the physiology and chemistry of nutrition.

The statistical study of dietaries.—A rejoinder, K. PEARSON (*Biometrika, 10 (1914), No. 1, pp. 172-174*).—The author defends the importance of statistics and apparently believes he has taken into account the different chemical and other necessary factors.

[This and the papers noted above make it clear that expert knowledge of statistical data is an important consideration in discussing the results of scientific investigation and make equally clear the difficulties in applying statistical methods without full knowledge of the subject matter to which they are applied. In this particular case the critic apparently has not fully appreciated the significance of such things as the laws of growth, the dual functions of food, and the influence of age, sex, and muscular work upon nutritive requirements.]

The influence of the total fuel value of a dietary upon the quantity of vitamin required to prevent beri-beri, W. L. BRADDON and E. A. COOPER (*Brit. Med. Jour.*, No. 2790 (1914), pp. 1348, 1349).—The authors discuss the general question and summarize experimental data with reference to the total fuel value of the food supply. They state that "by doubling the carbohydrate ration of the dietary [of pigeons and poultry] the rate of onset of polyneuritis was thus actually increased as much as from two to four fold. The results so far obtained demonstrated that the amount of antineuritic substance required by the organism increased with the quantity of carbohydrate ingested.

"There are at least two possible explanations of this phenomenon. First, the view already advanced by Funk [*E. S. R.* 31, p. 463] . . . that the

active substance participates in some way in carbohydrate metabolism, and thus the more metabolic work the organism is called upon to undertake the greater its demand in respect of this essential substance. Secondly, that when large rations of starch are ingested the absorption of the antineuritic material is interfered with owing to the presence in the alimentary canal of excess of undigested carbohydrate."

Experiments show that even when daily rations of polished rice amounting to as much as one-tenth of the body weight were fed to chickens together with varying amounts of yeast, from 93 to 98 per cent of the starch was digested and absorbed and that the excreta was free from the antineuritic substance. It was also noted that in vitro starch did not absorb the substance from the aqueous solution. Pigeons fed exclusively on glucose, which is rapidly absorbed, developed polyneuritis.

"These observations exclude the physical factor, and show that the antineuritic substance is utilized in some way during carbohydrate metabolism. Whatever be the mechanism involved, it is clear that for the maintenance of health the intake of active substance must be adjusted in relation to the ration of carbohydrate supplied, and it is when this necessary balance is not maintained in the dietary that beri-beri results.

"The precise relation which must subsist between the supply of antineuritic substance and the amount of carbohydrate ingested has not yet been ascertained, nor has the corresponding relation for each of the other normal components of a dietary (protein and fat) been determined. Funk . . . however, has made some experiments which indicate that protein and carbohydrate can be interchanged in a dietary without materially affecting the rate of onset of polyneuritis, whereas if these food materials be replaced by fat the disease develops less readily.

"The fact that attention must be paid not merely to the absolute amount of antineuritic foodstuff incorporated in the dietary but also to the proportion which this bears to its total calorific value is of great practical importance in framing a dietary for the prevention of beri-beri."

Quantity of a diet in relation to quantity of vitamin (*Brit. Med. Jour.*, No. 2790 (1914), pp. 1373, 1374).—A discussion of the data reported above. The observations, it is stated, demonstrate "that the antineuritic substance is expended in some way in carbohydrate metabolism, so that the larger the amount of carbohydrate consumed the greater the demand of the organism in respect to the essential substance. . . .

"[In framing a dietary to obviate beri-beri] it is advisable to maintain the amount of antineuritic foodstuff as high as possible and to avoid large rations of food materials deficient in vitamin."

Nutritive properties of proteins of the maize kernel, T. B. OSBORNE and L. B. MENDEL (*Jour. Biol. Chem.*, 18 (1914), No. 1, pp. 1-16).—The authors report experiments in continuation of those previously reported (*E. S. R.*, 28, p. 759).

It is pointed out that when the entire maize kernel is fed the amino-acid deficiencies of zein are supplemented to a great extent by other proteins which contain the amino acids that zein lacks. An inadequate but cheap protein can, therefore, be supplemented by another protein which supplies the lacking amino acids. The relative economy of the added proteins depends largely on their amino-acid makeup.

The study of the effect of benzoic acid and its sodium salt on the animal organism, E. ROST, F. FRANZ, and A. WEITZEL (*Arch. K. Gsndhtsamt.*, 45 (1913), No. 4, pp. 425-490).—The technique is described and results reported of a series of experiments with dogs which show in general the following results:

In the case of a single administration of benzoic acid or sodium benzoate, vomiting was caused. In the case of daily administration of benzoic acid or its sodium salt, a typical poisoning was produced, the symptoms resembling human epilepsy. If the dose was continued death resulted through paralysis of the central nervous system. It was found that the smallest dose of sodium benzoate which produced toxic effects was 1 gm. per kilogram of body weight. Experiments carried out to determine the effect of glycocholic acid as an antidote for benzoic acid poisoning showed that this substance caused the benzoic acid to be excreted in the urine as hippuric acid.

An extensive bibliography is appended.

The contribution of bacteria to the feces after feeding diets free from indigestible components, T. B. OSBORNE and L. B. MENDEL (*Jour. Biol. Chem.*, 18 (1914), No. 2, pp. 177-182).—The experiments reported, in which rats were fed upon diets composed entirely of digestible foods which yielded no cellulose residue, permitted the authors to determine the quantity of bacterial cells in the dried feces by successively treating them with ether, absolute alcohol, 80 per cent alcohol, 0.2 per cent hydrochloric acid solution, and finally with absolute alcohol containing 0.2 per cent hydrochloric acid to remove any fats, protein, or mineral matter. The remaining residue was finally analyzed for nitrogen and ash.

From the microscopic appearance and staining qualities of this residue and from its chemical composition, the authors feel justified in regarding it as consisting of masses of bacterial cells rather than undigested food residue.

Urea: Its distribution in and elimination from the body, E. K. MARSHALL, Jr., and D. M. DAVIS (*Jour. Biol. Chem.*, 18 (1914), No. 1, pp. 53-80).—The results are reported of a large number of experiments from which the following are among the conclusions drawn:

"Urea is present in all the organs and tissues of normal animals.

"The urea content of all organs and tissues is approximately uniform, and approximately equal to that of the blood, both in normal conditions and when there is an abnormally large amount of urea present. Exceptions to this rule are fat, which has a low content, and the urinary tract, which has a high content.

"When urea in solution is injected intravenously, it diffuses to all parts of the body almost instantly, the diffusion being complete in a few minutes.

"Urea is eliminated very rapidly by the kidneys; the rate of excretion may rise to 16 gm. per kilogram of body weight per day, or much higher.

"When excretion of urea is prevented, the entire amount formed is stored in the body—except small amounts secreted in the bile, sweat, etc.—and there is no evidence of the conversion of urea into other substances."

The suppression of growth and the capacity to grow, T. B. OSBORNE and L. B. MENDEL (*Jour. Biol. Chem.*, 18 (1914), No. 1, pp. 95-106).—A digest of experimental data which, in the opinion of the authors, does not support the view that the ability to grow "is lost with age, independently of whether it has or has not functioned during the period usually associated with increase in size. . . . It appears as if the capacity to grow is only lost by the exercise of this fundamental property of animal organisms."

The basal, gaseous metabolism of normal men and women, F. G. BENEDICT, L. E. EMMES, P. ROTH, and H. M. SMITH (*Jour. Biol. Chem.*, 18 (1914), No. 2, pp. 139-155).—The authors report the results of a series of observations made upon normal men and women at rest. Some of the experiments were carried out with the bed calorimeter and some with an especially designed respiration apparatus. Among the observations reported were the amount of carbon dioxide produced, the oxygen consumption, the value of the respiratory quotient, the body temperature, and the pulse rate.

ANIMAL PRODUCTION.

International catalogue of scientific literature. L—General biology (*Internat. Cat. Sci. Lit.*, 9 (1912), pp. VIII+117; 10 (1913), pp. VIII+138; 11 (1913), pp. VIII+130).—These volumes contain the usual indexes in four languages, an author catalogue, and a subject catalogue of manuscripts received between December, 1909, and January, 1913. The subjects included are methods, general morphology, general physiology, and general cytology. See also previous notes (E. S. R., 24, p. 670).

The effect of previous nutrition upon metabolism during fasting, A. SCHLOSSMANN and H. MURSCHHAUSER (*Biochem. Ztschr.*, 53 (1913), No. 4-5, pp. 265-299; *abs. in Internat. Inst. Agr. [Rome]*, *Mo. Bul. Agr. Intel. and Plant Diseases*, 4 (1913), No. 10, p. 1577).—In experiments at the Akademische Kinderklinik at Düsseldorf dogs were starved until they lost one-third of their weight, when their gaseous interchange was determined. One of the dogs was then fed fat, another carbohydrate, and a third protein, until each had attained its original weight. A fasting period of 24 hours followed, concluded by a respiration experiment. In another experiment the dogs were deprived of feed for periods lasting from 1 to 16 days.

It was concluded from these experiments that the respiration quotient depends, in the case of a fasting animal, upon the substances which have previously taken part in building up its body. When a single substance, such as glycogen or fat, is fed the body accustoms itself to consume more or less glycogen or more or less fat and the respiratory quotient approaches very nearly the theoretical quotient for that particular substance. With long and continuous fasting, the glycogen supply is more quickly consumed than the fat supply.

Studies in the comparative biochemistry of purin metabolism.—II, The excretion of purin catabolites in the urine of ungulates, A. HUNTER, M. G. GIVENS, ET AL. (*Jour. Biol. Chem.*, 18 (1914), No. 3, pp. 403-416).—The studies reported in this paper were conducted with the ungulate group, including the sheep, goat, cow, horse, and pig, and the results compared with those obtained with Carnivora, Rodentia, and Marsupialia. It was observed that "most ungulates, yet apparently not all, have a capacity for uric acid oxidation inferior to that of the orders just mentioned." The "total endogenous purin metabolism per unit of weight is in a general way inversely related to the size of the animal; but there are many striking exceptions, and many other factors evidently play a part in determining this relation."

Notes on some indigenous and other fodder plants, C. F. JURITZ (*Union So. Africa Dept. Agr. Sci. Bul.* 6 (1914), pp. 20).—Analyses are given of fodder plants grown in South Africa, including vlei grass, mangolds, tussock grass, Muskus grass, American aloe, prickly pear, and Kafir melon, and also of grape marc.

Statistics of British feeding trials and the starch equivalent theory, T. B. WOOD and G. U. YULE (*Jour. Agr. Sci. [England]*, 6 (1914), No. 2, pp. 233-251, figs. 7).—A statistical examination was made of the results of a large number of British feeding experiments, including about 200 trials with oxen and 200 trials with sheep with a view to determining the reliability of the starch equivalent theory as applied to British conditions.

It is concluded that "while Kellner's starch equivalents may give a fairly accurate measure of the amount of fat production to be expected from various foods in the early stages of fattening, they fail to do so in the later stages, because as fattening approaches completion the law of diminishing return asserts itself, and a given amount of starch equivalent produces less and less fat

as time goes on and the animal gets ripe. Kellner's starch equivalents, too, fail when very liberal diets are used, because here the animal very quickly reaches that stage of fatness at which the law of diminishing return begins to make itself felt."

The authors propose the drawing up of a sliding scale for the utilization of starch equivalents varying with the conditions which have been shown to influence the utilization of the diet. In a consideration of the standard deviation in results obtained with individual animals it is shown that "the amount of variation in efficiency as fat-producing machines among animals of the same breed fed under identical conditions is remarkable."

The forage plants of German Southwest Africa, W. HEERING and C. GRIMME (*Arb. Deut. Landw. Gesell.*, No. 262 (1914), pp. VIII+106, pls. 40).—Analyses and digestion coefficients of the following species of grasses and forage plants are reported: *Andropogon contortus*, *A. nardus*, *A. papillosus*, *A. ischæmum*, *Antheophora hochstetteri*, *A. pubescens*, *Tragus racemosus*, *Panicum coloratum*, *P. maximum*, *P. nigropedatum*, *P. notabile*, *P. trichopus*, *Tricholæna dregeana*, *T. madagascariensis*, *Setaria verticillata*, *Pennisetum ciliare*, *Aristida alopecuroides*, *A. barbicollis*, *A. ciliata*, *A. congesta*, *A. namaquensis*, *A. obtusa*, *A. stipoides*, *A. uniplumis*, *Sporobolus indicus*, *S. nebulosus*, *Cynodon dactylon*, *Chloris virgata*, *Dactyloctenium ægyptiacum*, *Pappophorum abyssinicum*, *P. cenchroides*, *P. scabrum*, *Schmidtia pappophoroides*, *S. quinqueseta*, *Pogonarthria fleckii*, *Triraphis ramosissima*, *Diphachne fusca*, *Fingerhuthia africana*, *Eragrostis denudata*, *E. echinochloidea*, *E. lævissima*, *E. porosa*, *E. superba*, *E. trichophora*, *Cyperus usitatus*, *Kyllingia alba*, *Asparagus asiaticus*, *Osyris abyssinica*, *Atriplex vesicaria*, *Kochia salsoloides*, *Salsola aphylla*, *Leucosphæra bainesii*, *Cyathula hereroensis*, *Barbavia pentandra*, *Phacoptilon spinosum*, *Anisostigma schenckii*, *Mesembrianthemum rupicola*, *Polanisia lüderitziana*, *Cleome rubella*, *Boscia fœtida*, *B. pechuelii*, *Cadaba juncea*, *Kalanchoë paniculata*, *Albizzia anthelmintica*, *Acacia albida*, *A. giraffæ*, *A. hebeclada*, *A. hereroensis*, *A. horrida*, *A. maras*, *Parkinsonia africana*, *Peltophorum africanum*, *Crotalaria diversistipula*, *Tephrosia purpurea*, *Rhynchosia gibba*, *R. totta*, *Zygophyllum affine microcarpum*, *Tribulus terrestris*, *Commiphora africana*, *Aitonia capensis microphylla*, *Flueggea obovata*, *Croton gratissimus*, *Cephalocroton püschelii*, *Heeria mucronata*, *Rhus albomarginata*, *R. ciliata*, *Zizyphus mucronatus*, *Helinus ovatus*, *Grewia bicolor*, *G. olukonde*, *Hermannia affinis tenella*, *Tamarix usneoides*, *Combretum hereroense*, *C. primigenium*, *Royena pallens*, *Ehretia hottentotica*, *Bouchea pinnatifida*, *Leucas pechuelii*, *Solanum incanum*, *Aptosimum albomarginatum*, *Rhigozum trichotomum*, *Catophractes alexandri*, *Petalidium unifolium*, *P. physaloides*, *Blepharis edulis*, *Cucumis prophetarum*, *Citrullus vulgaris*, *Nidorella auriculata*, *Tarchonanthus camphoratus*, *Dicoma anomala*, *Garuleum bipinnatum*.

Feeding value of various grasses, A. GRÉGOIRE and E. CARPIAUX (*Min. Agr. et Trav. Pub. [Belgium], Off. Rural Raps. et Communs.*, No. 8 (1914), pp. 5-48).—In sheep feeding experiments to determine the digestibility of hays of various grasses it was found that there was a general decrease in the digestibility of the hay as the grass reached maturity, but the amount of decrease varied considerably with the different species. The content of protein and fat showed the greatest variation.

The actual feeding value of these hays was found to vary considerably from the Kellner standard. The addition of calcium carbonate to the ration exerted no influence on the digestibility, but appeared to have an influence on the utilization of the absorbed elements. A ration composed entirely of hay increased the losses of phosphoric acid and lime to the animal organism, especially when the

It is concluded that the Kellner starch values are uncertain and do not agree with results obtained in actual practice. The mixing of feeds and the specific values of certain feeds depreciate the value of the standard.

III. *Respiration and assimilation trials with cattle*, R. von der Heide, Klein, and N. Zuntz (pp. 765-832).—In these trials it was found that slight variations in the composition of feeds influenced the fermentation process in the paunch of the ruminant. Variations in the character of feeds influenced the quantity of hippuric acid in the urine! There was found to be a material variation from Kellner's starch values. The actual starch value of hay fed as a fodder with potato refuse was double the value of the Kellner standard.

IV. *Mineral assimilation with cattle*, M. Diakow (pp. 833-844).—The digestible coefficients of the mineral compounds are given as follows: P_2O_5 from 24.5 to 28.6 per cent, CaO 15.8 to 26.5 per cent, MgO 39.2 to 47.9 per cent, Na_2O 52.4 to 61.5 per cent, and K_2O 92.3 to 94.5 per cent.

Commercial feeding stuffs, W. J. JONES, JR., F. D. FULLER, E. G. PROULX, C. CUTLER, and J. H. ROOP (*Indiana Sta. Bul.* 177 (1914), pp. 47-340, fig. 1).—This reports analyses of the following feeding stuffs: Wheat bran, wheat middlings, red dog flour, low grade flour, rye middlings, buckwheat bran, cotton-seed meal, cotton-seed feed, cold-pressed cotton seed, cotton-seed hulls, linseed meal, distillers' dried grains, brewers' dried grains, malt sprouts, gluten feed, corn-germ meal, hominy feed, corn bran, corn flakes, rice products, dried sugar beet pulp, alfalfa meal, dried blood, meat meal, meat-and-bone meal, beef scrap, fish scrap, feeding tankage, molasses feeds, and various mixed and proprietary feeds. There are included the text of the State feeding stuffs law, rulings to date, and similar data.

Analysis of feeding stuffs made for the State Department of Agriculture, B. E. CURRY and T. O. SMITH (*New Hampshire Sta. Bul.* 169 (1914), pp. 26).—Analyses are reported of wheat middlings, bran, red dog flour, and other wheat products, cotton-seed meal, hominy feeds, molasses feeds, alfalfa meal, dried beet pulp, distillers' dried grains, linseed meal, gluten feed, beef scrap, bone meal, fish scrap, and various mixed and proprietary feeds. The text of the state feedings stuffs law is included.

Fertilizers, feeds, and fungicides, J. W. INCE (*North Dakota Sta. Spec. Bul.*, 3 (1914), No. 9, pp. 140-146).—Analyses are reported of screenings, pigeon grass, wild oats, Kinghead, smartweed, ragweed, pigweed, lambs' quarters, shrunken wheat, corn fodder, corn silage, tankage, and meat scrap, as well as of fertilizers, Paris green, lead arsenate, lime sulphur, and commercial insecticides and fungicides.

The Kansas feeding-stuffs law revision of 1913, W. M. JARDINE (*Kansas Sta. Circ.* 38 (1914), pp. 7).—This is an explanation of the Kansas feeding-stuffs law as revised in 1913, with other data as to its enforcement.

Study of the breeds, varieties, and crossing of species of cattle in France, DE LAPPARENT (*Bul. Mens. Off. Renseig. Agr.* [Paris], 13 (1914), Nos. 5, pp. 493-551; 6, pp. 641-715).—This treats of the origin, development, and breed characteristics of the principal breeds of cattle in France, among them the Flemish, Dutch, Normandy, French Durham, Brittany, Parthenaise, Charolaise, etc.

Some problems of cattle breeding, L. J. COLE (*Guernsey Breeders' Jour.*, n. ser., 6 (1914), No. 1, pp. 22-25, figs. 4).—A study made of the records of American-bred and of imported Guernseys indicates that on the average "Guernsey cows imported to this country . . . are somewhat higher producers of milk and butter fat than the Guernseys bred in this country, in spite of the fact that

the latter have a slight advantage in percentage of butter fat in the milk. On the other hand, the native-bred stock make a decidedly better showing with respect to the number of advanced registry progeny they have produced, both of sons and of daughters."

Preparing wool for market, T. R. ARKELL (*Canada Dept. Agr., Live Stock Branch, Pamphlet 2 (1914), pp. 8, figs. 5*).—Directions are given for caring for sheep in order to produce a good quality and condition of wool, and for preparing and packing wool.

Wool and its manufacture, T. R. ARKELL (*Canada Dept. Agr., Live Stock Branch, Pamphlet 3 (1914), pp. 13, figs. 10*).—Information is given on the character of the wool fiber, tests for wool in cloth, classification of wools in the fleece, skirting and sorting the fleece, scouring, and carbonization.

Studies on the material and energy metabolism of growing swine, G. FINGERLING, A. KÖHLER, F. REINHARDT, E. BRETSCH, G. ARNDT, and R. DIETRICH (*Landw. Vers. Stat., 84 (1914), No. 3-4, pp. 149-230*).—In experiments with swine in which rations were fed in which the various nutritive elements predominated, it was demonstrated that on the average the power of assimilation of growing swine is 35.1 per cent greater for protein elements, 31.8 per cent for fat, 30 per cent for carbohydrates, and 32.1 per cent greater for sugar than indicated by Kellner's values for ruminants. The value of crude fiber is less for swine than for ruminants.

Experiments with swine, G. E. DAY (*Ann. Rpt. Ontario Agr. Col. and Expt. Farm, 39 (1913), pp. 101-104*).—The results of feeding experiments with 40-lb. pigs indicated that supplemental feeds, such as skim milk or tankage, have a marked influence in increasing the gains and improving the thrift of pigs over middlings and barley meal alone. One hundred lbs. of meal proved equal to 406.9 lbs. of skim milk and to from 37.6 to 48.5 lbs. tankage, depending upon the grade used. The skim milk was fed in the proportion of about 1½ lbs. to 1 lb. of meal, the tankage 1 lb. to about 6 lbs. of meal.

The results of feeding experiments with 125-lb. hogs indicated that the feeding of supplemental feeds, such as skim milk and tankage, for finishing hogs is not a profitable practice.

Value of skim milk for swine feeding, J. HANSEN ET AL. (*Deut. Landw. Presse, 41 (1914), Nos. 45, pp. 549, 550; 46, pp. 561, 562*).—Several lots of pigs were fed a basal ration of barley and potatoes, group 1 receiving as a protein supplement meat and fish meal and group 2 skim milk. In one lot fed 69 days, group 1 received a starch value of 1,455.3 kg., made an average daily gain of 0.708 kg. per head, and required 2.71 kg. starch value per kilogram of live weight; while group 2 utilized 1,508.9 kg. starch value, made 0.705 kg. daily gain per head, and required 2.58 kg. starch value per kilogram of live weight. In another lot fed 98 days, group 1 utilized 2,270.4 kg. starch value, made 0.848 kg. daily gain per head, and required 2.49 kg. starch value per kilogram of live weight, while group 2 utilized 2,965.2 kg. of starch value, made 0.869 kg. daily gain per head, and required 2.49 kg. starch value per kilogram of live weight.

Forage crops for hogs, W. J. KENNEDY, J. M. EVVARD, H. H. KILDEE, and E. T. ROBBINS (*Iowa Sta. Bul. 136 (1913), pp. 5-116, figs. 15; popular ed., pp. 383-419, fig. 1*).—In three years' experiments in which a total of 461 high-grade Duroc Jersey hogs were fed, the relative efficiency of various forage crops and pastures for pork production in Iowa was determined. In these experiments corn and meat meal 10:1 were fed in such quantity as to require the pigs to get the full benefit of the forage supplements. The summarized results are shown in the table following.

Results of feeding trials of forage crops with hogs, 1909-1911.

Kind of forage.	Average number of hogs per acre.	Number of days.	Average daily gain per head.	Average daily gain per 100 lbs. live weight.	Total cost per pound of gain (corn at 50 cts. per bushel).	Net profit per acre (hogs at \$6 per head).	Total grain per pound of gain.	Net return per bushel of corn.	Pork accredited to an acre of forage (estimated).
<i>Spring pigs—Current year.</i>									
			<i>Lbs.</i>	<i>Lbs.</i>	<i>Cents.</i>		<i>Lbs.</i>	<i>Cents.</i>	<i>Lbs.</i>
Blue grass and timothy.....	13.9	165	0.72	3.68	4.09	\$31.85	3.93	75.6	378.27
Medium red clover.....	13.9	165	1.07	3.63	3.69	57.07	3.52	88.0	765.42
Do.....	13.9	165	1.07	3.66	3.73	56.00	3.55	87.2	742.12
Do.....	18.8	141	.84	3.50	3.71	51.20	3.71	84.6	756.62
Do.....	18.8	141	1.13	3.74	3.84	64.55	3.54	90.4	649.66
Alfalfa.....	13.9	165	.99	3.82	3.96	46.39	3.67	82.2	623.22
Do.....	16.5	180	1.04	4.04	2.88	97.09	3.45	103.8	865.54
Rape (Dwarf Essex).....	16.7	147	.81	3.89	3.63	47.47	3.26	93.0	666.48
Do.....	18.8	104	1.36	3.62	3.95	54.24	3.71	82.5	633.94
Do.....	20.0	141	1.10	3.64	3.79	68.64	3.27	92.2	730.63
Do.....	43.1	160	1.07	4.28	3.91	154.63	3.85	80.2	1,438.80
Sweet clover.....	22.5	141	1.02	3.96	3.70	74.50	3.38	91.0	854.25
Do.....	20.0	150	.53	4.36	3.54	39.50	3.76	88.9	340.64
Oats.....	30.0	90	.63	4.66	4.10	32.53	3.65	81.0	398.93
Oats, clover, and rape.....	16.7	147	.91	3.61	3.56	54.70	3.18	95.0	795.41
Oats, peas, and rape.....	16.7	147	.85	3.91	3.91	43.86	3.39	86.1	657.10
Do.....	23.5	160	1.15	4.08	3.77	96.99	3.52	87.7	1,147.70
Do.....	23.5	160	1.16	4.24	4.10	83.26	3.67	81.8	760.86
Do.....	30.9	160	1.16	4.16	3.88	122.13	3.70	84.1	1,299.08
Rye (green).....	31.1	60	.81	4.51	3.67	35.18	3.24	95.2	347.46
Rye (ripe).....	22.5	36	.26	.61	7.75	-3.83	1.69	9.4	-44.50
Check dry lots.....	9.8	120	.24	3.98	5.87	.35	5.97	51.2	.....
Do.....	10.0	150	.63	4.28	4.36	15.56	3.99	76.2	.....
<i>Hogs—Fall pigs of previous year.</i>									
Oats, clover, and rape.....	11.1	169	1.22	2.50	4.95	24.02	4.45	64.2	82.90
Oats and clover (alternate with rape).....	12.5	169	1.17	2.57	5.02	24.27	4.60	62.8	18.23
Oats, peas, and rape.....	11.1	169	1.31	2.41	4.73	31.33	4.14	68.5	308.01
Oats, vetch, and rape.....	11.1	169	1.21	2.53	5.08	21.00	4.47	62.4	72.46
Check dry lot.....	10.0	169	1.41	2.91	4.76	29.79	4.72	65.9	.....
<i>Yearling sows (not pregnant)—Spring pigs of previous year.</i>									
Oats, clover, and rape.....	9.3	100	1.01	1.70	4.59	13.32	3.79	70.7	305.43
Oats, peas, and rape.....	9.3	100	.92	1.64	5.31	5.94	4.16	59.3	223.43
Rape, clover (½ area in each).....	9.3	100	.96	1.67	4.23	15.86	4.00	74.7	256.88

There is included a discussion of the essentials of an ideal forage for hogs, together with analyses of the green forage crops used in these experiments, and a table showing the cost of growing these forages and their production value.

Pork production in Wisconsin, J. G. FULLER (Wisconsin Sta. Bul. 242 (1914), pp. 3-35, figs. 26).—This bulletin includes general instructions on the feeding, care, and management of swine under Wisconsin conditions, including plans for hog houses and other equipment.

Distribution of public service stallions, A. S. ALEXANDER (Wisconsin Sta. Circ. 50 (1914), pp. 3-82, figs. 7).—A directory of the public service stallions enrolled in the counties of Wisconsin during 1914, with a discussion of the improved conditions in the State.

The breeding of heavy draft horses in the Province of East Prussia, A. LANDMANN (Kühn Arch., 4 (1914), pp. 137-293, pls. 2).—This is an account of the native breeds of horses of the Province of East Prussia, together with a discussion of possible methods of improving their utility value by crossing and

selection. Measurements were made of a large number of cross-bred horses and comparisons made with those of pure-bred Belgians, showing the advantage of using this breed in cross-breeding operations.

Preliminary notes on the heredity of certain characters in a cross between silky and Yokohama fowls, J. L. BONHOTE (*Cairo Sci. Jour.*, 8 (1914), No. 91, pp. 83-89).—"The object of these experiments, which have so far been carried to the F₂ generation, has been not only to study the inheritance of certain definite characters but also to study the comparative inheritance of these characters and to see if certain combinations would occur with greater frequency than others. The silky male was dark-fleshed, white with short silky feathers, a rose comb, five-toed, with feathered legs and a small crest. The Yokohama female was white-fleshed, duckwing with long normal feathers, a single comb, four-toed, clean legs, and no crest." The characters involved are discussed in detail and it is shown how the expected Mendelian proportions with regard to each character have been to a large extent realized. The author endeavors to prove that "recessive characters will occur more frequently in females owing to the absorption of more of their initial vigor on their sex, and so that recessive characters more usually associated with the female can be produced in males by an artificial reduction of vigor (cf. dun color in pigeons)."

On the average the females have 0.41 more recessive characters than the males, and the whites 0.74 more recessive characters than the colored. It is suggested that "the proportions of Mendelian characters may be to a certain extent governed by other causes, notably vigor, and that therefore from a practical point of view it becomes possible to increase the number of individuals possessing a certain character by attention to such details as the food, temperature, age of breeding stock, and time of year at which breeding takes place."

Improving egg production by breeding, R. PEARL (*Maine Sta. Bul.* 231 (1914), pp. 217-236, figs. 3).—This material has been previously reported (E. S. R., 29, p. 874).

Some factors influencing the bacterial content and keeping quality of eggs, L. D. BUSHNELL and O. MAURER (*Kansas Sta. Bul.* 201 (1914), pp. 749-777).—The authors summarize the results of their studies, in which 2,759 eggs were examined, as follows:

"Almost all the eggs containing bacteria were infected in the yolk, while very few of them showed bacteria in the white. Very few of the bacteria in eggs grow at blood temperature, while they grow abundantly at room temperature. This is of special interest because of its bearing on the hatching quality of eggs. The number of infected eggs increases slightly with the age of the fowl. Eggs from different hens vary widely in bacterial content and keeping quality. The extremes for the whole period are percentage of eggs infected—minimum 15, maximum 42; percentage of eggs spoiled—minimum 4, maximum 34. The eggs from the same hens vary widely in bacterial content and keeping quality at different times, and without apparent cause. When the fowls were given range the number of infected eggs decreased. Feeding wet mash produced an appreciable rise in the number of infected eggs. This increased infection was due to bacteria growing at blood temperature.

"Mating of the hens did not increase infection of the eggs, as determined by our methods. This suggests that the greatly increased spoilage of fertile eggs is a direct or indirect consequence of the development of the embryo. Besides giving rise to losses from blood rings, etc., the presence of a dead embryo seems to increase the susceptibility of the eggs to decomposition. We have observed frequent and striking divergencies between the number of eggs infected and the number of eggs spoiled. Increase in infection and decrease in

keeping quality do not necessarily run parallel because it is the qualitative rather than the quantitative bacterial content that determines keeping quality. It follows that our quantitative method for determining the infection in eggs does not furnish us a very reliable index to the influence of various factors upon the keeping quality of our eggs.

"Summer eggs show more bacteria than fall eggs, and as shown in Bulletin 180 [E. S. R., 27, p. 73] also more bacteria than spring eggs. The ratio of coagulable to uncoagulable nitrogen did not reveal any appreciable influence of the factors investigated upon the keeping quality of the eggs examined. No grass eggs were laid by a number of hens whose diet consisted chiefly of alfalfa, nor could any green pigment-forming bacteria be detected in such eggs."

Attention is called to recent studies made by the Connecticut Storrs Station (E. S. R., 31, p. 171) in which a much lower bacterial infection was obtained. It is stated that this discrepancy can not be accounted for as being due entirely to contamination during the manipulation of the cultures. A bibliography is included.

Farm poultry in Missouri, H. L. KEMPSTER (*Missouri Bd. Agr. Mol. Bul.*, 12 (1914), No. 7, pp. 98, figs. 52).—A general account of the methods of feeding, care, and management of poultry, with special reference to Missouri conditions, and including artificial incubation, brooding, care of market eggs, and prevention and cure of poultry diseases.

The encyclopedia of the poultry yard, V. SHAW (*London and New York*, 1913, pp. IX+178, pls. 16, figs. 21).—An encyclopedia on breeds of poultry and general poultry topics.

Ostrich breeding and feather handling in South Africa and other countries, H. HINTZE (*Tropenpflanzer*, 18 (1914), Nos. 5, pp. 259-271; 6, pp. 323-331; 7, pp. 381-392).—A general account of the distribution and commercial importance of the ostrich in South Africa and elsewhere, and a discussion of methods of management for commercial purposes.

Rabbit breeding industry in Germany, A. R. THOMSON (*Daily Cons. and Trade Rpts.* [U. S.], 17 (1914), No. 171, pp. 454, 455).—It is stated that the rabbit raising industry in Germany has received a marked impetus during the past few years owing to governmental encouragement. During the past five years the demand for rabbit meat caused the price to increase from approximately 7.1 to 23.84 cts. per head.

DAIRY FARMING—DAIRYING.

[Bibliography of dairy literature], R. W. RAUDNITZ and W. GRIMMER (*Arch. Geb. Milchw. u. Molk. Praxis*, 1913, I, No. 17, pp. 40).—This is a general review of articles on the science and practice of dairying published during a portion of the year 1913.

A dairy laboratory guide, H. E. ROSS (*New York*, 1914, pp. VI+84, pl. 1).—General instructions for use in the dairy laboratory.

Feeding of dairy cows, N. ATHANASSOF (*Rev. Vet. e Zootech.*, 1 (1911), No. 3, pp. 162-174, pls. 4; 2 (1912), Nos. 1, pp. 58-65, pls. 2; 3, pp. 102-114; 4 (1914), Nos. 1, pp. 73-86; 2, pp. 127-143; 3, pp. 174-188).—This is a general exposition on the theory of the feeding of dairy cows, including a discussion of the physiology of milk secretion, the influence of individual and breed upon milk yield, and the influence of methods and time of milking. The author outlines the main principles of the Kellner theory of feeding and feed requirements for milk production. There is included a discussion of the feeding value

of the various roughages, concentrates, and commercial feeds especially adapted to South American conditions.

Holstein milk yield, F. R. MARSHALL (*Jour. Heredity*, 5 (1914), No. 10, pp. 437-439).—In continuation of work previously reported (E. S. R., 27, p. 574) the author presents the results of examinations made by P. Van Ewing of the records of Holstein cattle, in which it appeared that the idea that milking capacity in cows is transmitted through males rather than females is erroneous. The number of cases in which resemblance was closest on the maternal side were for pounds of milk 403, pounds of milk fat 407, and percentage of milk fat 345, while the number of cases in which resemblance was closest on the paternal side were 262, 258, and 320, respectively.

Studies in the range of variation of the percentage of butter fat in the milk of individual cows, A. C. ANDERSON (*Michigan Sta. Spec. Bul.* 71 (1914), pp. 3-13, figs. 5).—In a study of 200 seven-day records of dairy cows it was found that 27.5 per cent varied not over 1 per cent in milk fat in the seven days, 44 per cent varied between 1.1 and 2, 21.5 per cent between 2.1 and 3, 4 per cent between 3.1 and 4, 1.5 per cent between 4.1 and 5, and 0.5 per cent between 5.1 and 6. In a study of 2,000 seven-day records of cows on advanced registry tests the percentages were as follows: 28.45, 54.55, 13.4, 2.65, 0.8, and 0.15. In 600 two-day records the percentages were 74.3, 20.1, 4.6, 0.5, and 0.3.

Some investigations on the phenomena of "clot" formations.—I, On the clotting of milk, S. B. SCHRYVER (*Proc. Roy. Soc. [London]*, Ser. B, 86 (1913), No. B 590, pp. 460-481; *abs. in Jour. Chem. Soc. [London]*, 104 (1913), No. 612, II, pp. 850, 851).—In milk the substances necessary for clot formation preexist, but the adsorption of simple molecules from the solution prevents aggregation. In this work it is assumed that the ferment clears the surface of colloid from adsorbed substances and allows aggregation to take place.

The addition of calcium chlorid to solutions of caseinogen in sodium hydroxid gives a precipitate only within certain definite limits of concentration of the calcium salt. Rennet, when added to a mixture in which precipitation is inhibited by an excess of the calcium salt, immediately causes precipitation. When the optimal amount of calcium salt is present precipitation may be prevented by adding milk serum, peptone, or glycin. Rennet precipitates only when a proper amount of inhibitor is present; an excess prevents precipitation. The clot is formed from caseinogen and not from the calcium salt.

"The clot produced by rennet alone is formed from metacaseinogen; that produced by calcium chlorid alone is formed from caseinogen. The rennet clot can not be converted into natural caseinogen. The rennet does not in any way affect proteoclastic digestion in the clot. In milk the clot formation depends on the presence of four series of substances in the system, namely, simple inhibitory substances, colloids, enzymes, and calcium salts."

The growth and viability of streptococci of bovine and human origin in milk and milk products, D. J. DAVIS (*Jour. Infect. Diseases*, 15 (1914), No. 2, pp. 378-388).—From investigations made in connection with epidemics of sore throat it appeared that all the streptococci causing the epidemic were of the hemolytic variety. A study of these showed that "in the process of milk souring the growth of hemolytic streptococci is inhibited and the organisms are gradually destroyed. They are killed in three hours or less by the acidity of sour milk (48 hours after curdling) and of buttermilk. In ordinary butter they die in the course of a few days, due to the acidity, although in neutral butter they live for a long time. In ice cream, hemolytic streptococci remain alive for at least 18 days without any appreciable diminution in number or virulence. Ice cream would seem to be, therefore, a most suitable medium for the transmission and preservation of dangerous streptococci. Separator cream contains

more streptococci than the whole milk, skim milk considerably less, while the sediment contains a large number.

"Hemolytic streptococci do not multiply to any extent at 20° C. or below in milk; at 26° there is little or no multiplication during the first six hours in sterile or commercial milk, but at the end of 20 hours there is considerable increase in the sterile milk. In the commercial milk their growth is inhibited by the growth of other bacteria; this holds also for higher temperatures. It seems that under no conditions met with in the ordinary handling of milk can there occur any appreciable multiplication of hemolytic streptococci. Inasmuch as under the most favorable temperature multiplication of hemolytic streptococci in milk does not occur inside of one to two hours, it is impossible for any appreciable increase to occur during the short interval between the raising and lowering of the temperature of milk in the process of pasteurization."

The characteristics of bacteria of the colon type found in bovine feces, L. A. ROGERS, W. M. CLARK, and ALICE C. EVANS (*Jour. Infect. Diseases*, 15 (1914), No. 1, pp. 99-123, figs. 5).—This paper records the results of a study made of 150 cultures isolated from bovine feces.

"None of these cultures liquefied gelatin and all but one formed indol from tryptophan. By the use of a simple medium and exact methods of analysis it was found that in 149 cultures the CO₂:H₂ ratio varied only from 0.98 to 1.2. One culture only gave a ratio identifying it with the high-ratio group which made up 48 per cent of the milk series [of previous studies (E. S. R., 30, p. 875)].

"The 149 low-ratio (0.98 to 1.2) cultures were readily divided into two groups, one of which fermented dextrose, saccharose, lactose, raffinose, mannite, glycerin, and dulcitol, but almost invariably failed to ferment starch, inulin, and adonite, while the second group fermented adonite and dulcitol and failed to ferment saccharose, raffinose, starch, and inulin. "These groups agree almost perfectly with two groups which may be formed from the low-ratio cultures isolated from milk."

Inexpensive aids in producing sanitary milk, R. W. LAMSON (*Maryland Sta. Bul.* 181 (1914), pp. 135-154, figs. 6).—The author concludes from his study of methods of producing sanitary milk that discarding the first few streams of foremilk reduces the bacterial content. Pails having a flat strainer on to which the milk is drawn are not to be recommended, and many of the so-called "sanitary" pails were complicated and hard to keep clean. The use of glycerin, sweet oil, or vaseline as a wash for the udder, teats, and flank decidedly reduced the bacterial content of the milk. Clipping the udder and flank appeared to aid in the production of sanitary milk. The use of these simple methods and precautions lowered the bacterial content of milk from one-third to one-tenth.

Cream grading for Kansas, G. S. HINE (*Kansas Sta. Circ.* 39, pp. 4).—An outline of the plan of cream grading adopted by Kansas creamery companies, together with directions on how to get first-grade cream.

Cheese that the farmers should make, M. R. TOLSTRUP (*Iowa Agr.*, 15 (1914), No. 2, pp. 89, 90).—Information is given on methods of making club cream, nut cream, olive cream, pimento and cottage cheeses, and Devonshire salad.

Action of the enzymes due to organisms on the rind of hard cheeses, O. GRATZ and S. SZANYI (*Biochem. Ztschr.*, 63 (1914), No. 4-6, pp. 436-478, figs. 15).—In a study of the various layers of cheese, starting from the outside and proceeding inward, it was found that in Trappist and Ovar cheeses the enzymes of the flora of the rind have no action on the decomposition of casein and fat in the inside of the cheeses. On theoretical grounds the possibility of the diffusion of the enzymes from the rind toward the interior must be rejected.

Cheeses of the Neufchatel group, K. J. MATHESON, C. THOM, and J. N. CURRIE (*Connecticut Storrs Sta. Bul.* 78 (1914), pp. 313-329, figs. 3).—The

process of making Neufchatel and cream cheese is described and analyses reported.

"An approximate standard of composition for whole-milk Neufchatel or Neufchatel proper is water 50 to 55 per cent, fat 23 to 28 per cent, casein about 18 to 21 per cent, salt 0.5 to 1.25 per cent. Such cheese is best produced from good clean milk testing about 4 per cent fat. Yield of cheese per 100 lbs. of milk, 12 to 14 lbs. A similar standard of composition for cream cheese (made from cream testing 7 to 9 per cent fat) is water 38 to 43 per cent, fat 43 to 48 per cent, casein 13 to 16 per cent, salt 0.5 to 1.25 per cent. Yield per 100 lbs. of cream, 16 to 18 lbs."

The salt factor in the mold-ripened cheeses, C. THOM (*Connecticut Storrs Sta. Bul. 79 (1914), pp. 387-394, fig. 1*).—From the results of these studies the author concludes that "the percentage of salt which may be incorporated into a variety of cheese is directly limited by the intensity of the flavors to be developed. In the hard cheeses with their mild flavors, more than 1 to 1.5 per cent salt becomes offensive. In Camembert 2.5 per cent is acceptable, and in Roquefort, 4 per cent.

"As a factor in cheese biology, salt restrains the development of *Oidium* in Camembert and shuts it out of Roquefort. Salt delays but does not prevent the development of the molds active in ripening Camembert, Roquefort, and the ripened forms of Neufchatel. Ten per cent of salt in culture media stopped or reduced to negligible the growth of *Penicillium pinophilum*, *P. lilacinum*, *P. luteum*, *P. digitatum*, *P. purpurogenum*, *P. roseum*, *P. duclauxi*, *Aspergillus nidulans*, *A. fumigatus*, and *Oidium (Oospora) lactis*. The rate of development of the other species tried was markedly retarded but more or less characteristic colonies finally developed."

Supplementary data upon Camembert cheese making, K. J. MATHESON, C. THOM, and J. N. CURRIE (*Connecticut Storrs Sta. Bul. 79 (1914), pp. 348-358*).—Material here given supplements data previously reported (*E. S. R.*, 22, p. 79). It is concluded from these observations that Camembert cheese making is commercially practicable along the lines presented in this and the preceding paper.

Biology of Roquefort cheese, C. THOM and K. J. MATHESON (*Connecticut Storrs Sta. Bul. 79 (1914), pp. 335-347, figs. 3*).—The authors summarize the results of their studies as follows:

"The flora of Roquefort cheese consists of the Roquefort mold (*Penicillium roqueforti*), bacteria of the common lactic type (*Bacillus lactis acidii* group) and of the *B. bulgaricus* group in small numbers, some liquefying organisms, yeasts in small numbers, and the varied flora of the surface slime. The organisms of the slime, yeasts, bacteria, and *Oidium lactis* have been eliminated in paraffining experiments completely enough to indicate for them only a secondary function in ripening the cheese. The slime in normal amount has been found to be a correct index to proper ripening room conditions, however. The lactic bacteria account for the primary souring of the curd which should take place within the first 24 hours, thus eliminating gassy fermentation.

"The low temperatures used reduce the activity of *B. bulgaricus* to negligible amounts during the early stages of the ripening. The extent to which organisms of this group participate in the final ripening changes has not been determined. The dominance of *P. roqueforti* within the cheese is secured by the low oxygen content of the open spaces and by the high salt content which excludes *O. lactis*. Known activities of *P. roqueforti* through enzym production are the reduction of acidity, proteolysis of casein, and partial decomposition of fat. These appear to be the principal factors in ripening the cheese, although some participation in these processes by the bacteria and yeasts found is not excluded by any work thus far possible.

"From the study of acidity in Roquefort curd the following results are deemed important: With initial acidities of 0.25 per cent or higher in milk, and temperature of 84° F. (29° C.) the production of acid becomes very rapid within the first two hours. Graphs representing the rate of rise of acidity become parallel or nearly so after the percentage reaches 0.25 to 0.27 per cent. Below this percentage great diversity in the rate of souring represents the differences in chemical composition of the sample of milk, the variations due to vigor of culture, amount of inoculation, temperature, and perhaps other features. The acidity produced during the first two and one-half or three hours will be enough to change the texture of the curd if the initial percentage is 0.25 per cent, or if during that period the amount shown in the milk sample passes 0.27 to 0.3 according to the other conditions present. At acidities of 0.21 or lower the development of acid is too slow to give sufficient aid in proper drainage of whey from the curd.

"To obtain a margin of safety in the production of a smooth, friable curd, free from waxy, granular, or tough characteristics, the initial acidity should not pass 0.23 per cent, which approaches, therefore, the optimum initial acidity in cow's milk for this type of cheese. With a vigorous, pure culture of the *B. lactis acidi* group as a starter the initial acidity may be obtained with equally good results by adding enough starter to raise the titration figures of the milk to 0.23 per cent or by the use of little starter with a subsequent ripening period. The former practice is usually preferable as an economy of time.

"At the working temperature of Roquefort, the organisms of the *B. bulgaricus* group are not a factor in the initial souring. The low temperatures that characterize this process make desirable the use of a large enough amount of starter to insure the dominance of the lactic organism of the starter over any variety which may be accidentally present. Comparison of the graphs showing the rate of development of acid under Cheddar and Roquefort conditions show that this amount of inoculation (the percentage of starter used) will need to be greater in Roquefort than in Cheddar to secure the same protection from the acid organisms."

The manufacture of a cow's milk cheese related to Roquefort, C. THOM, K. J. MATHESON, and J. N. CURRIE (*Connecticut Storrs Sta. Bul.* 79 (1914), pp. 359-386).—"This reports an investigation of the possibility of making a cheese from cow's milk which will equal Roquefort as made from sheep's milk. Results thus far indicate that texture and flavor as produced in sheep's milk cheese can be approximated but not duplicated. One thoroughly familiar with the qualities of Roquefort and especially with both cheeses before him can detect the difference between them. The quality produced has been such as to lead us to believe that the completion of the work will add a profitable product to our dairy manufactures in this country."

A description of the practices found most successful is given.

VETERINARY MEDICINE.

Tropical diseases, a manual of the diseases of warm climates, P. MANSON (London, New York, Toronto, and Melbourne, 1914, 5. ed., rev. and enl., pp. XXIV+937, pls. 16, figs. 239).—The several sections of this manual deal with the subject as follows: Fevers (pp. 1-416); general diseases of undetermined nature (pp. 417-446); abdominal diseases (pp. 447-598); infective granulomatous diseases (pp. 599-665); animal parasites and associated diseases (pp. 666-837); skin diseases (pp. 838-883); and local diseases of uncertain nature (pp. 884-895). In an appendix (pp. 896-922) some of the commoner parasitic Protozoa of vertebrates and invertebrates are dealt with.

Toxic brans, MARCHADIER and GOUJON (*Ann. Falsif.*, 7 (1914), No. 64, pp. 77-81).—It is claimed that the determination of the acidity of a bran will give an idea as to the amount of oxidizing ferments present and also as to the toxicity of the bran. Brans having an acidity of 0.15 per cent (expressed in terms of sulphuric acid) are deemed normal. Those containing from 0.15 to 0.3 per cent are considered in a state of decomposition, and while not dangerous to health, are susceptible to rapid spoilage. An acidity higher than 0.3 per cent is thought to make the feed unsuitable for consumption.

A pathogenic bacterium in fish meal, MIESSNER and LANGE (*Deut. Tierärztl. Wchnschr.*, 21 (1913), No. 47, p. 745).—During the course of examinations of fish meal for the presence of the anthrax bacillus, the authors discovered a capsulated bacterium, pathogenic for mice, rabbits, and rats, to which they give the name *Diplobacillus capsulatus*.

The specificity of immunity reactions, and their explanation as colloidal chemical phenomena, K. LANDSTEINER (*Biochem. Ztschr.*, 50 (1913), No. 1-2, pp. 176-184; *abs. in Jour. Chem. Soc. [London]*, 104 (1913), No. 608, I, p. 668).—The conclusions of Michaelis and Davidsohn that certain immunity reactions are not of a colloidal chemical character are not deemed justifiable.

"The view was arrived at on the ground that certain precipitin reactions are independent to a large extent of the hydrogen ion concentrations. Attention is especially called to the fact that serum, blood corpuscles, etc., of different species exert the maximum action in the presence of different hydrogen ion concentrations. This point is illustrated by the adsorption of ricinus agglutinin, by the different strengths of acid or alkali which hemolyze the corpuscles, by the differences in the agglutination of stromata, and the differences in the precipitability of the sera-precipitating reagents."

Alimentary anaphylaxis caused by eggs, G. LAROCHE, C. RICHET, JR., and F. SAINT-GIRONS (*Arch. Med. Expt. et Anat. Path. [Paris]*, 26 (1914), No. 1, pp. 51-59).—Experiments were made with guinea pigs, which received either the white of eggs, the yolk, or the white and yolk, mixed with green feed.

The results show that anaphylaxis can be easily produced in guinea pigs providing large amounts of eggs are fed over a long period of time. It is also possible to arrive at a point of immunity which is not considered to be an antianaphylaxis.

Serum anaphylaxis in the bovine, SKIBA (*Deut. Tierärztl. Wchnschr.*, 21 (1913), No. 22, pp. 338-340; *abs. in Ztschr. Immunitätsf. u. Expt. Ther.*, II, Ref., 7 (1913), No. 8, pp. 362, 363).—Of 23 young bovines which had received 10 cc. of anthrax serum (Sobernheim) subcutaneously 10 became anaphylactic after a second injection of serum 20 to 30 minutes post injection. The symptoms remained for 10 to 20 minutes. A third injection 33 days later resulted in 15 animals becoming anaphylactic.

Sources of error in the dialysis method in serological investigations. About the influence of the blood content of organs, E. ABDERHALDEN and A. WEIL (*München. Med. Wchnschr.*, 60 (1913), No. 31, pp. 1703, 1704; *abs. in Zentbl. Expt. Med.*, 5 (1914), No. 1, p. 15).—The use of sera or organs not free of blood never gives satisfactory results. Coagulable serum protein and coagulated blood corpuscles were treated in a manner prescribed by Abderhalden, and the former was cleaved only 3 times and the latter 46 times out of 96 cases. After the injection of 3 cc. of hemolytic serum in the jugular vein the blood of the animal digests blood corpuscles but not serum proteins.

The occurrence of protein-cleaving ferments in the blood in advanced hunger, E. HEILNER and F. POENSGEN (*München. Med. Wchnschr.*, 61 (1914), No. 8, pp. 402, 403).—When protein loss is prevented by the utilization of the body glycogen, no protein cleavage ferments are present in the blood serum. As

starvation proceeds and the fat depots have been utilized, the ferments make their appearance and can be noted by the Abderhalden methods.

Nucleoproteins as antigens, H. G. WELLS (*Ztschr. Immunitätsf. u. Expt. Ther.*, I, Orig., 19 (1913), No. 5, pp. 599-611).—The author believes that pure nucleins are probably not antigens in the ordinary sense of the term because their constituents (nucleic acid, and histones or protamins) are not antigens. Much depends upon the method of preparing the nucleoproteins, and there exists no ground for assuming that these protein nuclein complexes are in a measure specific or characteristic of the cells from which they are derived.

A review of the literature is given.

On the anemia produced by the injection of the hemolysin obtained from streptococci, and on the question of natural and acquired immunity to streptolysin, J. W. M'LEOD and J. W. M'NEE (*Jour. Path. and Bact.*, 17 (1913), No. 4, pp. 524-537, pls. 2).—"Rabbits vary in their susceptibility to injections of streptolysin, the variation being, in part at least, due to differences in the amount of natural antibody to streptolysin present in their sera. The more susceptible animals die after one or two injections, evidently from a toxic effect of the filtrate. Hemoglobinemia and hemoglobinuria are marked in these animals, and the toxic and hemolytic properties of the filtrate are closely related. It has not been possible to demonstrate toxic effects of the filtrate after destruction of the hemolysin by incubation at 37° C. The less susceptible animals survive repeated injections. No toxic symptoms occur, and a definite anemia results. Slight hemoglobinuria follows as a rule when the filtrate injected is a powerful one.

"The changes in the blood are similar to those which have been produced experimentally by other hemolytic agents. The bone marrow in the longer experiments becomes markedly hyperplastic. The leucoblastic and erythroblastic portions of the marrow as a rule react equally. The liver shows as marked a hemosiderin reaction, post-mortem, as the kidneys and spleen. This contrasts with experimental anemia in rabbits produced by injection of a hemolytic immune serum. In the greatly enlarged spleen of one animal a very marked myeloid transformation was found. Large collections of myelocytes, many in active mitosis, surrounded closely each Malpighian body. No immunity to the streptolysin is produced even after repeated injections. On the contrary, a slightly increased susceptibility may result. The amount of hemolysis produced in vivo is much less than that which is produced in vitro. In the animal body, as in the test tube, hemolysis does not continue for more than about two hours. Hemoglobinemia is most marked after this interval, then gradually disappears."

See also a previous note (E. S. R., 28, p. 179).

The method whereby streptococcic serum acts, E. WEIL (*Ztschr. Hyg. u. Infektionskrank.*, 75 (1913), No. 2, pp. 245-310).—Streptococci do not intoxicate by virtue of a true toxin or endotoxin and the nature of the poison is still unknown. Polyvalent serum (Aronson) can be rendered inactive to the original streptococcus by saturation with killed cultures. In order for the serum to act the presence of living leucocytes is necessary. No antiaggressins are contained in the serum and it is inactive toward most streptococcic strains obtainable from man. Despite the polyvalent origin of the serum it contains only one immune body, by means of which it acts upon strains toward which it has an affinity, and only a few of the strains are capable of reacting in the horse.

Abderhalden serodiagnosis of cancer, C. F. BALL (*Jour. Amer. Med. Assoc.*, 62 (1914), No. 8, pp. 599-602, fig. 1).—This gives the results of tests and a description of a new form of apparatus for making the test.

The use of Abderhalden's reaction in carcinoma and tuberculosis, E. FRÄNKEL (*Berlin. Klin. Wchnschr.*, 51 (1914), No. 8, pp. 356-358).—This is a

study of the literature and relates some of the author's experience with the method. While the results obtained with serum from tuberculous subjects are more satisfactory than the ones given by carcinomatous subjects, they are not entirely reliable.

Experimental transmission of *Coccidium oviforme* of the domestic rabbit, A. LUCET (*Bul. Soc. Cent. Méd. Vét.*, 90 (1913), No. 24, pp. 446-453, figs. 5; *Compt. Rend. Acad. Sci. [Paris]*, 157 (1913), No. 22, pp. 1091, 1092).—The author concludes that the two species of *Coccidium* described by Leuckart are distinct, and that two forms of coccidiosis occur in the domesticated rabbit, one, the hepatic form, caused by *Eimeria stiedæ* (*C. cuniculi*, *C. oviforme*); the other, the intestinal form, by *E. perforans* (*C. perforans*).

Experimental study of cœnurosis in the rabbit, A. HENRY and A. CIUCA (*Ann. Inst. Pasteur*, 28 (1914), No. 4, pp. 365-386; *abs. in Rev. Bact.*, 4 (1914), No. 2, p. 28).—Experimental infection of the rabbit with *Cœnurus serialis*, which is the cystic stage of *Tænia serialis* of the dog, was obtained in from 40 to 50 per cent of the tests where young rabbits were used, if fertile segments of the worm were selected and if the rabbits were fed with the segment without other food. The cysts appear on about the eighteenth day and attain full development within four months.

A study of the serum of infected rabbits shows that it possesses properties resembling those found in infection by the echinococcus. Precipitins are not found in the natural disease, which the authors regard as being due to the impermeability of the membrane, as precipitin appears after the escape of the fluid into the tissues by operation or injection. Complement fixation tests gave positive results in two out of ten cases of natural infection, and in all four cases of experimental infection. The serum of infected rabbits produced passive anaphylaxis in guinea pigs whether or not a positive complement fixation reaction was obtainable.

Degeneration of the islands of Langerhans associated with experimental diabetes in the cat, J. HOMANS (*Jour. Med. Research*, 30 (1914), No. 1, pp. 49-68, pls. 3).—"The islands of Langerhans must be deeply concerned with experimental pancreatic diabetes, for (a) the removal of more than three-quarters of the pancreas of the cat, leaving the main duct in situ, usually leads to a disappearance of secretory granules in the islands of Langerhans, with suggestive evidence of over activity without the production of diabetes, and (b) the same procedure occasionally causes a degeneration of the islands of Langerhans accompanied by fatal diabetes without disturbance of the remaining acinous tissue."

A bibliography of 23 titles is appended.

In regard to the use of mallein, MOUILLERON (*Bul. Soc. Cent. Méd. Vét.*, 91 (1914), No. 2, pp. 63-77).—A description of cases of glanders in which the mallein test did not give a hyperthermic reaction. The hyperthermic reaction of itself is not deemed sufficient to diagnose the presence of glanders, and it is advisable to consider other clinical signs in condemning animals. It is also recommended that a second mallein test be made.

It is obvious that under conditions where hyperthermia is present the test can not be used.

A discussion of the paper by Drouin, Jacoulet, Bourgès, Martel, Mouilleron, and Letard is included.

The production of antirabic immunity by intraspinal injections of virus, D. L. HARRIS (*Jour. Infect. Diseases*, 11 (1912), No. 3, pp. 397-401; *abs. in Zentbl. Biochem. u. Biophys.*, 14 (1913), No. 19-20, p. 759).—It appears that by giving one intraspinal injection of noninfectious dried virus to rabbits, a certain and rapid immunity can be produced.

The immunization of large animals to a pathogenic trypanosome (*Trypanosoma hippicum* Darling) by means of an avirulent strain, S. T. DARLING (*Jour. Expt. Med.*, 17 (1913), No. 5, pp. 582-586; *abs. in Ztschr. Immunitätsf. u. Expt. Ther.*, II, Ref., 7 (1913), No. 8, pp. 378, 379).—Mules were immunized successfully with an avirulent strain of *T. hippicum*.

The vitality of the tubercle bacillus by inoculation and by inhalation, P. CHAUSSÉ (*Bul. Soc. Cent. Méd. Vét.*, 91 (1914), No. 2, pp. 42-57, figs. 2).—At the outset the theories of Cornet and Flüge are discussed, but considered inadequate to explain infection by inhalation.

In the investigation the vitality of the tubercle bacillus under the influence of diffuse light, temperature, and humidity was studied with regard to causing the disease in healthy individuals. The tests were made in a special form of inhalation chamber. The conclusions reached are that the virus is very dangerous during the first stages of drying and can be easily inhaled.

The detection of tubercle bacilli in inhalable dust, L. ENGELHARDT (*Beitr. Klinik Tuberkulose*, 26 (1913), No. 2, pp. 155-184, figs. 10; *abs. in Centbl. Bakt. [etc.]*, 1. Abt., Ref., 57 (1913), No. 8, p. 235).—The air of living rooms in which three very clean patients with open tuberculosis resided was examined. In each case the results were positive for tubercle bacilli. No tubercle bacilli were noted in the room of a healthy person, nor in the case of joint tuberculosis.

The presence of tuberculides in bovines, PÉBARD and RAMON (*Compt. Rend. Soc. Biol. [Paris]*, 74 (1913), No. 3, pp. 133, 134; *abs. in Centbl. Bakt. [etc.]*, 1. Abt., Ref., 57 (1913), No. 8, p. 251).—In the subcutaneous tissues of three bovines there were found numerous homogeneous, yellowish-green, slightly fibrous nodules the size of a nut. Similar nodules were found in the viscera, but here they were caseated in the interior and calcified on the exterior. The bacteriological examination showed tubercle bacilli to be present. The changes are believed to be similar to the tuberculides or sarcodes found in man. The cases were due to organisms with diminished virulence.

The alimentary tract of pigs affected with tuberculosis mesenteric lymph nodes, M. JUNACK (*Ztschr. Fleisch u. Milchhyg.*, 24 (1914), No. 14, pp. 321, 323).—In the author's opinion, too much stress during meat inspection must not be laid upon a minor involvement of the mesenteric lymph glands.

The differentiation of the human and bovine types of tubercle bacilli by producing an experimental, corneal, and iris tuberculosis in the rabbit's eye, and some investigations in regard to the significance of complement-fixing antibodies, F. SCHIECK (*Veröffentl. Robert Koch Stift.*, No. 5-7 (1913), pp. 1-132, pls. 2; *abs. in Centbl. Bakt. [etc.]*, 1. Abt., Ref., 58 (1913), No. 7-8, pp. 227, 228).—By instilling an emulsion of a pure culture of tubercle bacilli in the anterior chamber of the rabbit's eye, it was found possible to differentiate the human from the bovine type of bacillus. With the human type an attenuated or a resolving tuberculous process is produced in the iris. The bovine type of bacillus, on the other hand, produces a progressive and caseating tuberculosis of the eye.

The human type of bacillus, when given in the opposite eye, goes through its usual course.

Injection of the bovine type of tubercle bacillus in the common carotid artery induces a rapidly progressing tuberculosis of the eye on the same side. The human type does not do this.

The complement-fixing antibodies apparently have nothing to do with the healing process in tuberculosis. The Wassermann-Bruck theory of specific therapy in tuberculosis could not be confirmed by this work.

A clinical study of the complement fixation test in the diagnosis of pulmonary tuberculosis, H. M. KINGHORN and D. C. TWICHELL (*Ztschr. Tuberc.*

kulose, 20 (1913), No. 1, pp. 11-21; abs. in *Centbl. Bakt. [etc.]*, 1. Abt., Ref., 58 (1913), No. 7-8, p. 234).—Apparently no significance can be attached to the complement fixation reaction as regards the early diagnosing of cases of tuberculosis.

Diagnostic and curative methods in bovine tuberculosis, A. ONDRACEK (*Tierärztl. Zentbl.*, 36 (1913), No. 32, pp. 488-491; abs. in *Berlin. Tierärztl. Wchnschr.*, 30 (1914), No. 7, pp. 123, 124).—This details the work done in regard to the eradication of bovine tuberculosis in Göding, Austria.

Up to 1909 Bang's procedure was used with good success, but the tuberculin testing which was done in conjunction with the method caused a diminution of the milk yield. After 1909 Klimmer's phymatin eye test was employed. The tuberculin (phymatin) is instilled in the morning, and the first temperature observation is made after 6 to 12 hours. Cows not reacting within this time should be given another test after 24 hours. The curative properties of anti-phymatol were studied with 59 cows, and an injection was made every three months for a period of one year. In one barn very good results were obtained, and in the other the results were not so good but satisfactory.

Tuberculin and tuberculosis immunity, DEYCKE and MUCH (*München. Med. Wchnschr.*, 60 (1913), Nos. 3, pp. 119-121; 4, pp. 190-193; abs. in *Chem. Abs.*, 7 (1913), No. 8, p. 1378).—"The authors continued previous studies with the products of the 'Milchsäure aufschliessung' of tubercle bacilli and compared them with tuberculin (old). The material giving the tuberculin reaction (subcutaneous tests) in the water solution filtrate was precipitated by alcohol and alcohol-ether; this precipitate gave the reaction, but it was only equivalent (quantitatively) to that remaining in the alcohol and alcohol-ether filtrates. There is a marked difference in the activity of the different fractions for the intracutaneous reaction; the protein is 1,000 times as active as the fatty acid lipid mixture, which is 10 times as active as the neutral fat.

"There is also a marked difference between the protein and fatty substances with regard to the appearance of the intracutaneous reaction; while the protein reactions appear in a few hours and completely develop in 1 to 2 days, the fatty substances require a much longer time to develop, and for completion 1 to 2 weeks are necessary (the neutral fats being slower in action, appearing in 3 to 4 days, than the fatty acid lipid mixtures, appearing in 24 hours).

"The authors discuss tuberculosis immunity on the basis of their experiments with regard to cellular and humoral immunity."

Investigations as to the therapeutic action of tuberculin for tuberculosis in guinea pigs and rabbits, H. HAUPT (*Beitr. Klinik Tuberkulose*, 23 (1912), No. 4, pp. 471-524).—No curative action could be ascribed to tuberculin when artificially infected guinea pigs and rabbits were treated with this substance.

Tuberculin as a curative agent, and a contribution to tuberculosis immunity questions, H. HAUPT (*Berlin. Tierärztl. Wchnschr.*, 30 (1914), Nos. 2, pp. 28-30; 3, pp. 41-43; 4, pp. 60, 61).—After reviewing the literature on the use of tuberculin and similar substances for curing tuberculosis, experiments made with animals hypersensitized toward tuberculin are briefly reported (see abstract above). The animal organism, according to the author, can form tuberculosis antibodies after intravenous or subcutaneous injections of standardized tubercle bacilli antigens.

Healed tuberculous processes are recognized by marked encapsulation with connective tissue. These new formations (encapsulations) occur as soon as the tuberculous foci take the form of foreign bodies, and these result only when through the agency of the antibodies the tuberculous process has become checked.

Tuberculin, on account of its insufficient antigenic properties, is not deemed a satisfactory therapeutic agent for treating tuberculosis in bovines. Antiphymatol is considered the best agent for curing tuberculosis which we have to-day.

Tuberculosis.—A report of the results of the continued injections of tuberculin upon tubercular cattle, S. B. NELSON (*Washington Sta. Bul.* 114 (1914), pp. 3-15).—Impressed by the therapeutic work done with tuberculin on man affected with tuberculosis, the author made a series of experiments to study the effect of subcutaneous injections of tuberculin into cattle affected with tuberculosis. The tests were made "under the conditions under which the animals are generally kept; that is, a fairly well-kept stable in the winter time, being outdoors a part of the daytime, and a run to pasture during the summer months, being kept in the barnyard at night during this time."

It was found that the injection into tubercular cattle of large monthly or small weekly doses of tuberculin had apparently no therapeutic value. "The injection of constantly increased daily or weekly doses of tuberculin apparently does have therapeutic value. The evening temperature is usually higher than the morning temperature in tubercular cows. The oftener tuberculin injections are made into tubercular cattle, the sooner the temperature reaction begins and the sooner the zenith is reached."

The specific treatment of tuberculosis with Bruschettini's serum vaccine (preliminary communication), A. BRUSCHETTINI (*Ztschr. Tuberkulose*, 20 (1913), No. 1, pp. 43-48; *abs. in Centbl. Bakt. [etc.]*, 1. Abt., Ref., 58 (1913), No. 7-8, p. 241).—Bruschettini's serum was prepared by vaccinating animals with lung extracts from tuberculinized animals, but particularly those animals in which a hyperleucocytosis took place, and with an emulsion of fat-free tubercle bacilli in hydrogen peroxid. The serum is given with a vaccine prepared from tubercle bacilli which have been exposed to the action of living leucocytes.

The author hopes to give at the next International Congress of Tuberculosis an account of the methods of using the vaccine.

Bovovaccine against bovine tuberculosis, A. ALMGREN (*Svensk Vet. Tidskr.*, 18 (1913), No. 4, pp. 146-148; *abs. in Ztschr. Immunitätsf. u. Expt. Ther.*, II, Ref., 7 (1913), No. 13, p. 591).—Bovovaccine is deemed of service in combating tuberculosis in bovines.

Antiphymatol and phymatin of Klimmer as a means of combating tuberculosis in bovines, C. TITZE (*Deut. Tierärztl. Wchnschr.*, 21 (1913), No. 23, pp. 353-356; *abs. in Ztschr. Immunitätsf. u. Expt. Ther.*, II, Ref., 7 (1913), No. 8, pp. 365, 366).—On the basis of the experiments reported in the literature antiphymatol is deemed of no value for combating tuberculosis. Phymatin does not seem to possess any advantages over Koch's old tuberculin. With the ophthalmic reaction it is not possible to obtain in practice results which are valuable for detecting the presence of tuberculosis.

Bovine anaplasmosis in Argentina, J. LIGNIÈRES (*Centbl. Bakt. [etc.]*, 1. Abt., Orig., 74 (1914), No. 1-2, pp. 133-162, figs. 5).—This is a detailed report of investigations of anaplasmosis by the director of the Bacteriological Institute of the Ministry of Agriculture at Buenos Aires.

Anaplasmosis occurs endemically in certain regions in the north of Argentina, from which it may be carried accidentally to other zones by infected bovines, which serve as reservoirs for the virus. *Anaplasma argentinum* is of the same type as *A. marginale*, but a comparative study of the two is necessary before definite conclusions as to their specific relation can be drawn. In nature anaplasmosis does not occur alone, but in connection with the piroplas-

moses due to *Piroplasma bigeminum* and *P. argentinum*. It may also be transmitted by the same tick, namely, *Margaropus microplus*; it is not transmitted by Stomoxys.

The inoculation of bovines with *Anaplasma* may be accomplished equally well through subcutaneous, intravenous, and intramuscular injections. The incubation period is notably longer than for the piroplasmoses and the course is more irregular. Animals vaccinated against *P. bigeminum* and *P. argentinum* remain susceptible to *Anaplasma*, and bovines immunized against *Anaplasma* are susceptible to *P. bigeminum* and *P. argentinum*. Anaplasmosis is a specific disease distinct from piroplasmosis.

The vaccine treatment of mammitis in cattle, A. PAYNE (*Vet. Jour.*, 70 (1914), No. 464, pp. 94-96).—Three cases affected with streptococcic mammitis were treated with a vaccine consisting of killed streptococci and staphylococci, with good results. The vaccine was given subcutaneously in a fold of the skin above the udder and anterior to the patella in four doses at intervals of three days apart. The first dose was 250,000,000 and the last 750,000,000 bacteria.

A contribution to sheep plague, "septicæmia pluriformis ovium (Miessner and Schern)" and combating the same by serum in practice, H. RAEBIGER, W. KLIEM, and E. SEIBOLD (*Deut. Tierärztl. Wchnschr.*, 21 (1913), No. 10, pp. 145-149; abs. in *Ztschr. Immunitätsf. u. Expt. Ther.*, II, Ref., 7 (1913), No. 8, p. 355).—The immunization with specific serum seems to have given good results.

Annual report of the camel specialist for the year 1913-14, H. E. CROSS (*Ann. Rpt. Camel Specialist [Punjab], 1913-14*, pp. 17+III).—This annual report deals largely with the diseases of camels, especially with the treatment of surra. A report on the biting flies in the Punjab by Patel (pp. I-III) is appended.

Vaccination against hog cholera, H. HOLTERBACH (*Österr. Wchnschr. Tierheilk.*, 38 (1913), p. 57; abs. in *Centbl. Bakt. [etc.]*, 1. Abt., Ref., 58 (1913), No. 4, pp. 111, 112).—When a diagnosis for hog cholera is uncertain the author recommends injecting several of the sick animals with Hutyra's vaccine, some with Suisseptiferin, and others with a mixture of both substances. The animals receiving the Hutyra serum alone in this investigation recovered quickly, those injected with Suisseptiferin died, and those receiving both substances showed some improvement. The diagnosis was hog cholera.

Suggestions that will assist in the prevention and control of hog cholera, F. S. SCHOENLEBER (*Kansas Sta. Circ.* 40 (1914), pp. 3).—Directions are given for the cleaning and disinfecting of farms where hog cholera exists or existed during the past year. The means that should be taken to prevent the disease from gaining entrance to the farm are also pointed out.

Eighteen cases of pectoral influenza treated with atoxyl, G. PALMGREN (*Svensk Vet. Tidskr.*, 19 (1914), No. 1, pp. 6-13; abs. in *Rev. Gén. Méd. Vét.*, 23 (1914), No. 271, pp. 377, 378).—While salvarsan has been recognized as a specific for pectoral influenza, its high price and the favorable results obtained by Bochberg^a from the use of atoxyl led to the experiments here reported.

The author administered atoxyl subcutaneously to three horses, increasing the daily dosage from 0.3 to 0.4 to 0.5 to 0.75 gm. The treatment, which was commenced on the second and third days of the disease, respectively, and continued for four days, soon relieved the fever. In order to determine whether the temperature was raised by the injection of atoxyl, as has been observed in certain cases following the administration of salvarsan, records were made hourly up to the eighth hour following the injection but no hyperthermia resulted.

^a *Ztschr. Veterinärk.*, 22 (1910), No. 7, pp. 332-334.

Atoxyl was also administered subcutaneously, commencing from the second to the fourth day of the disease, to eight horses in daily doses of 0.5, 0.75, and 1.0 gm., respectively, and in a majority an improvement resulted. In two cases receiving 0.75 gm. on the fourth day, it was necessary to continue the treatment for four days.

Four horses were treated by a single subcutaneous injection of 4 gm. of atoxyl dissolved in 75 cc. of water, but unsatisfactory results were obtained with three of the horses. Three horses were treated by administering 4 gm. of atoxyl in 100 cc. of water intravenously; their temperature fell below 40° C. on the second, third, and fourth days following, respectively.

Serodiagnosis of pregnancy in mares, C. F. BRISCOE and E. M. RANCK (*Mississippi Sta. Tech. Bul. 5 (1914), pp. 8*).—The Abderhalden test was studied for diagnosing pregnancy in mares. The report is prefaced by a brief description of the test (E. S. R., 31, p. 278) and the sources of error which may be encountered in conducting it. About 10 animals were tested, including a Percheron stallion and an unbred Hackney filly, from which blood was collected before and two hours after feeding. The reactions were positive in all cases except that of the stallion, but the fact that the filly gave a test before feeding is attributed either to leaks in the diffusion thimble or to her having been accidentally in foal. The conclusions reached were as follows:

“The serodiagnosis of pregnancy is applicable to mares; and with due precautions is fairly reliable. To make the test reliable, it is necessary to control each individual test. Precautions must be taken to guard sources of error from bacterial contamination and from digestive products in the blood of the animal tested. The test is practicable for scientific experimentation and probably in the breeding of high-priced stock.”

The work is being continued and the authors hope to include in the tests other animals, as the cow, goat, and pig.

Manual of military farriery, L. A. BELTRAN (*Manual del Herrador Militar. Havana, Cuba, 1914. pp. V+182. figs. 108*).—This is a handbook on horse-shoeing.

A new nematode, *Rictularia splendida*, from the coyote, with notes on other coyote parasites, M. C. HALL (*Proc. U. S. Nat. Mus., 46 (1914), pp. 73-84, figs. 6*).—The parasite here described as new was collected from the small intestine of *Canis nebracensis*, at Amo, near Colorado Springs, Colo. A key is given for the separation of this from other species of the genus, and it is pointed out that the parasites of the coyote have practically the same considerable economic importance that those of the dog have.

RURAL ENGINEERING.

Irrigation and soil-moisture investigations in western Oregon, W. L. POWERS (*Oregon Sta. Bul. 122 (1914), pp. 3-110, figs. 23*).—This bulletin reports a continuation by the station, and on broader lines, of the preliminary investigations begun in cooperation with this Office (E. S. R., 23, p. 393). The experiments were extended to include studies of the effect of irrigation upon soil-moisture movements, moisture consumption by crops, best time and amount of application for different crops, and costs and profits, and covered a period of four years. The main purpose was to determine “the value of irrigation for ‘increasing and insuring productiveness’ of the agricultural lands in the semi-arid Willamette Valley and other similar valleys of western Oregon.”

Evaporation from the water surface from April 30 to October 1 averaged about 24 in. and the average rainfall for this period was 5.52 in. Under field condi-

tions the valley silt loam was found to have a maximum capillary water content of about 34 per cent, a maximum content for proper cultivation of about 27 per cent, an optimum water content of about 23 per cent, a drought point content of about 14 per cent, and a minimum moisture content of about 11 per cent.

Irrigation caused a higher seasonal moisture content but was associated with temporary loss in moisture in the subsoil, which was, however, regained between irrigations. The highest seasonal moisture content in irrigated plats was obtained in connection with early spring plowing, manuring, crop rotations, including legumes, and frequent cultivation. Irrigation caused a lowering of the temperature of the surface soil as much as 4° in cultivated plats and 10° in meadows, but caused an increase in yield of all crops, which averaged about 65 per cent for a 7-year period.

Kale, clover, and beets did better with one irrigation than with two and the reverse was true for potatoes. The use of 4 acre-inches of water per acre in the wet season and of about 6 acre-inches in the dry season produced the most economical increase of alfalfa, while the maximum yield was obtained with 6 in. in a wet season and 12 in. in a dry season. The most economical return with potatoes was obtained with 2 in. in a wet season and with 3 or 4 in. in a dry season, while the maximum yield with potatoes was secured with 3 in. in a wet season and 6 in. in a dry season. Clover was best irrigated on gray silt loam when the moisture content of the first 2 ft. dropped to about 14 per cent, while potatoes were best irrigated on this soil when the moisture content of the first foot dropped to 20 per cent. Potatoes did best with a uniform moisture content. Water was best distributed over this soil by the corrugation method.

"Irrigation has made it possible to raise two different crops in one season, and not only to get a cutting from new seeding of clover or alfalfa the first season, but also to secure a more perfect stand. It was found that under field conditions the use of a moderate amount of irrigation greatly reduced the water cost of dry matter, which varied about as the most economical returns per acre-inch, above which the water cost increases. The time and frequency of irrigation also affected the water cost. Growing crops in an irrigated rotation, including a legume, greatly decreased the water cost of dry matter as compared to growing crops in an unirrigated rotation following an unirrigated legume crop. The water cost under field conditions varied with the different crops and crop varieties. Kale and potatoes proved to be crops of high water requirement, while the reverse was true with corn and beans.

At a maximum price of \$1 per acre-inch, irrigation with pumped water applied to ordinary field crops made an average profit of \$2.66 per acre-inch. Electricity proved more economical than gasoline as a source of energy for a small pumping plant where labor cost was more important than fuel cost.

Proper irrigation did not injure the palatability of potatoes, decreased the percentage of culls, and did not increase the moisture content of crops except where irrigation was excessive. However, it altered the shape and size of plants, caused better shaped ears and a higher percentage germination in corn, a lower percentage germination in beans, and altered the percentage of marketable product, causing more beans in proportion to plant, more beets in proportion to top, but more vines in proportion to potatoes.

Irrigation caused a slight decrease in soil water capacity, an increase in volume weight where rank field crops were grown, but caused an improvement in this respect where soil-building crops were grown. It had little appreciable effect on the acidity or the available plant food content, and caused a decided increase in organic content where leguminous crops were grown.

In experiments on gravelly loam soil three 3-in. irrigations proved about the right amount for cultivated crops, and 18 in. in three applications for meadow crops. This soil allowed ready lateral percolation and was best irrigated by the furrow method. It responded most to fertilization with manure and lime, while other chemical fertilizers were less effective.

Soil-moisture experiments in southern Oregon showed a close relation existing between soil texture and moisture content and responsiveness to irrigation, light irrigations having the greatest relative effect on the moisture content. The soil temperature was lowered more by irrigation than by the shading of trees. There was a storage of heat in the soil near the close of the season, the subsoil being cool in the spring and warm in the fall as compared with the surface soil.

It is generally concluded that irrigation to be of much value in the Willamette Valley must be used only in a supplemental and proper way.

Records of heavy rainfall and run-off in Porto Rico, L. V. BRANCH (*Engin. News*, 71 (1914), No. 25, pp. 1358, 1359).—Data of the maximum run-off of the principal streams in the district under development by the Porto Rico Irrigation Service are given.

Irrigation studies, REYNIER (*Bul. Écon. Gouv. Gén. Madagascar*, 14 (1914), I, No. 1, pp. 3-15).—The work and conclusions of several experimenters are reviewed, particularly with reference to the relations between soil permeability and water utilization.

It is concluded that a knowledge of soil permeability is of prime importance in any irrigation enterprise as the permeability strongly influences not only the amount of water required but the choice of the method of irrigation. The establishment of a table of permeabilities of different soils under different conditions is suggested so that a permeability chart of an irrigated area may be maintained in connection with lysimeter measurements of evaporation under the crops grown, thus more rigorously regulating the use of irrigation water.

Pumping machinery, W. M. SCHUTTE (*Poona Agr. Col. Mag.*, 6 (1914), No. 1, pp. 20-25).—A comparison of power and animal methods of pumping irrigation water in Bombay shows that a saving is realized with the former method. The author states that in his experience the most reliable, simple, and efficient type of power for irrigation pumping is the kerosene oil engine of the 4-cycle type.

The construction, maintenance, and protection of levees, EHLERS (*Bau, Unterhaltung, und Verteidigung der Flussdeiche. Berlin*, 1914, pp. V+54, figs. 54; rev. in *Engin. Rec.*, 69 (1914), No. 15, p. 430).—In this book a brief introduction dealing with the various purposes and types of levees is followed by a discussion of their location and height. Subdivisions follow which deal with cross-sectional shape of levees, influence of character of available materials, etc. As to shape, the author advocates an addition at the downstream toe of a trapezoidal section. The slopes recommended are 1 on 3 on the upstream and 1 on 2 on the downstream side. Other chapters deal with construction of levees, summer levees, openings and culverts through levees, drainage projects, protection of levees in emergencies, and repair of washouts.

The construction of hydraulic-fill levees, D. L. YARNELL (*Engin. News*, 71 (1914), No. 24, pp. 1288-1290, figs. 5).—A description of the construction of levees by pumping fill through hydraulic dredges in drainage districts in Wisconsin and Illinois is given with illustrations of the works.

Specifications [for drain tile] proposed by American Society for Testing Materials (*Cement Era*, 12 (1914), No. 9, pp. 56-58).—The specifications proposed are for strength tests, quality of drain tile, and for recommended practice in the design and construction of tile drains.

Twenty-first annual report of the Massachusetts Highway Commission (*Ann. Rpt. Mass. Highway Com., 21 (1913), pp. 214, pls. 6, figs. 7*).—This report covers finances, administration, construction, and maintenance for the year ended November 30, 1913.

Permanent construction (*Seattle, Wash., 1914, pp. 54, figs. 37*).—This pamphlet deals in a popular manner with the selection, testing, and measuring of cement, sand, gravel, or crushed rock, and gives information as to methods of mixing them in the proper proportions for the manufacture of concrete. It points out also how to improvise tools and build the mixing board, measuring boxes, and forms for a large number of permanent improvements around the home and on the farm.

The use of Iowa gravel for concrete, T. R. AGG and C. S. NICHOLS (*Iowa Engin. Expt. Sta. Bul. 34 (1914), pp. 29, figs. 9; abs. in Good Roads, n. ser., 7 (1914), No. 23, pp. 326, 327*).—The contents of this bulletin comprise the results of a survey of deposits of concrete materials made by the Iowa Highway Commission.

A table to figure brickwork (*Brick and Clay Rec., 45 (1914), No. 5, p. 473, fig. 1*).—A table is given by means of which one may calculate the number of bricks required for any common types of brickwork.

Pocketbook of useful formulas and memoranda for civil, mechanical, and electrical engineers, G. L. and H. B. MOLESWORTH (*New York, 1913, 27. ed., pp. 944, figs. 800; rev. in Engin. Rec., 69 (1914), No. 7, p. 202*).—A revision of this handbook.

Agricultural machines and implements, J. HAGMANN (*Jahresber. Landw., 28 (1913), pp. 497-532, figs. 20*).—A number of reports on tests of agricultural machinery are briefly reviewed.

Motor-plow tests, 1913, G. FISCHER (*Arb. Deut. Landw. Gesell., No. 260 (1914), pp. 55, figs. 23*).—This is a detailed report of trials of 9 mechanical plowing outfits, including one 2-engine and cable system, 5 tractors, and 3 motor plows. The total trials included preliminary, general, duration, and brake tests.

The mechanical details of each machine and the methods of testing are described in full, and the test results reported in tabular and graphic form and discussed for each engine. The machines were tested on level ground and on ground with a heavy grade. The more important results obtained are summarized in the following table:

Results of motor-plow tests.

Type of outfit.	Normal brake horse- power.	Drawbar horse- power.	Plowing depth.	Plowing width.	Hourly capacity.	Type of fuel and heat units per pound.	Fuel con- sumption per acre.
			<i>Inches.</i>	<i>Inches.</i>	<i>Acres.</i>		<i>Pounds.</i>
Two engines and cable plow.	24.1	19.0	$\left. \begin{array}{c} 10.6 \\ 7.5 \end{array} \right\}$	45.0	$\left\{ \begin{array}{c} 1.05 \\ 1.04 \end{array} \right.$	Crude oil (4,200)...	$\left\{ \begin{array}{c} 17.5 \\ 15.0 \end{array} \right.$
Tractor and plow.....	64.7	36.2	$\left\{ \begin{array}{c} 10.6 \\ 7.5 \end{array} \right.$	95.0	$\left\{ \begin{array}{c} 1.78 \\ 1.94 \end{array} \right.$	Citin (4,325).....	$\left\{ \begin{array}{c} 27.8 \\ 21.8 \end{array} \right.$
Do.....	46.3	29.6	$\left\{ \begin{array}{c} 10.6 \\ 8.8 \end{array} \right.$	40.0	$\left\{ \begin{array}{c} .82 \\ 1.28 \end{array} \right.$	Benzol (4,360).....	$\left\{ \begin{array}{c} 22.8 \end{array} \right.$
Do.....	65.3	44.4	$\left\{ \begin{array}{c} 11.0 \\ 7.9 \end{array} \right.$	87.0	$\left\{ \begin{array}{c} 1.68 \\ 2.18 \end{array} \right.$	Benzine (4,550).....	$\left\{ \begin{array}{c} 26.4 \\ 18.3 \end{array} \right.$
Do.....			$\left\{ \begin{array}{c} 8.3 \end{array} \right.$	72.0	$\left\{ \begin{array}{c} .99 \end{array} \right.$	Benzol (4,360).....	$\left\{ \begin{array}{c} 33.4 \end{array} \right.$
Do.....	25.2	17.0	$\left\{ \begin{array}{c} 10.6 \\ 9.1 \end{array} \right.$	34.2	$\left\{ \begin{array}{c} .68 \\ .74 \end{array} \right.$	.....do.....	$\left\{ \begin{array}{c} 34.1 \\ 26.5 \end{array} \right.$
Motor plow.....	45.5	28.2	$\left\{ \begin{array}{c} 12.0 \\ 7.5 \end{array} \right.$	65.0	$\left\{ \begin{array}{c} 1.48 \\ 1.53 \end{array} \right.$	.....do.....	$\left\{ \begin{array}{c} 24.8 \\ 19.2 \end{array} \right.$
Do.....	51.2	34.6	$\left\{ \begin{array}{c} 10.4 \\ 8.0 \end{array} \right.$	82.0	$\left\{ \begin{array}{c} 1.29 \\ 1.39 \end{array} \right.$	.....do.....	$\left\{ \begin{array}{c} 21.2 \end{array} \right.$
Do.....	60.2	39.3	$\left\{ \begin{array}{c} 11.2 \\ 8.7 \end{array} \right.$	88.0	$\left\{ \begin{array}{c} 1.35 \\ 1.62 \end{array} \right.$	.....do.....	$\left\{ \begin{array}{c} 23.7 \\ 18.3 \end{array} \right.$

Under the test conditions it is concluded that all the outfits may be classed together as regards depth of plowing and plowing capacity. On damp and slippery soils two of the tractor outfits experienced considerable difficulty in operation, and the work of none of the outfits except the cable plow was entirely satisfactory on damp ground. Difficulty was generally experienced on steep grades, but the American plow arrangements which permit one or more of the shares to be raised was used with success on grades.

The cable system was particularly successful on stony soil, owing to the elasticity of the cable, but all of the outfits were sufficiently elastic in some of their main parts to do fairly good work on stony soil. The tractors were the most flexible for the different operations, but their broad wheels left a greater trace and were apparently more injurious to the soil than were those of the motor plows. The tractor outfits consumed the greatest amounts of fuel per unit volume of moved soil, followed in order by the motor plows and the cable outfit.

Report of international tests of mechanical cultivating apparatus in Tunis (*Bul. Dir. Gén. Agr., Com. et Colon., Tunis, 18 (1914), No. 79, pp. 445-503, pls. 30*).—A large number of mechanical cultivating implements are described and illustrated, and tests of outfits, including tractors, motor plows, and scarifiers, are reported. The test results, including the results of dynamometer tests, are given in tabular form. The more important results are summarized in the following table:

Results of tractor, motor plow, and scarifier tests.

Type of outfit.	Indicated horse-power.	Average required drawbar pull at 3.3 ft. per second plowing 7.9 in.	Plowed in 10 hours.	Fuel consumption per acre.	Type of fuel.
		<i>Pounds.</i>	<i>Acres.</i>	<i>Gallons.</i>	
Tractor.....	40 to 50	12.3	12.3	4.17	Essence.
Do.....	80	3,240	17.3	3.45	Do.
Do.....	55 to 60	5,030	14.8	5.40	Petrol.
Do.....	60	4,300	16.8	3.22	Do.
Do.....	40	2,060	6.9	6.64	Essence.
Do.....	60	2,200	13.6	5.17	Petrol.
Do.....	33 to 40	2,260	9.4	4.32	Do.
Do.....	30	3,960	11.1	5.80	Do.
Do.....	45	1,720	11.4	6.76	Do.
Motor plow.....	80 to 105	6,160	22.2	2.83	Essence.
Do.....	16 to 20	1,760	4.9	3.99	Do.
Do.....	42 to 50	5,720	19.8	2.28	Do.
Scarifier (plowing 9.85 in.).....			3.80	7.8	Do.
Scarifier (plowing 7.90 in.).....			3.96	9.6	Do.
Scarifier (plowing 7.10 in.).....			5.70	6.8	Do.

Silos and silage in Colorado, H. E. DVORACHEK (*Colorado Sta. Bul. 200 (1914), pp. 3-21, figs. 8*).—This portion of the bulletin sets forth some of the advantages of silos as they apply to Colorado conditions and the essentials to be considered in the selection of a suitable silo for that State. In this connection various types of silos commonly used are discussed as to their merits.

The homemade stave silo is said to be generally a costly experience. The patent stave silo is considered thoroughly established, but its measure of success is said to depend largely upon the method of construction, quality of material used, and the care and attention given it. Other wooden silos, includ-

ing the wooden-hooped, Wisconsin, and Gurler silos are said to have been used with variable success.

As regards the concrete silo it is stated that the percentage of failures is less with this type than with most others, and that the experience in that State has demonstrated that they are a success. When brick can be obtained cheaply a good silo can be built at a moderate cost. The vitrified hollow tile silo is considered the best silo made, embodying every factor which goes to make a perfect silo, but its cost is said to be almost prohibitive to all but the well-to-do or wealthy farmer. Metal silos are not wholly satisfactory in Colorado owing to freezing. The pit silo, for the money invested, is said to be by far the best silo used and the bank and trench silos, both of which are closely related to the pit silo, are said to be convenient and give good results where they may be used.

Building instructions for concrete silos, P. V. MARIS (*Colorado Sta. Bul. 200 (1914), pp. 32-49, figs. 12*).—This report, prepared in cooperation with the Dairy Division of this Department, contains instructions for the building of the monolithic concrete silo, including illustrations, working plans, and bills of material.

Report on construction of pit silos at the Plains substation, J. W. ADAMS (*Colorado Sta. Bul. 200 (1914), pp. 49-55, figs. 4*).—The details of construction of two pit silos, each 10 ft. in diameter and having depths of 23 and 28 ft., are reported. To insure durability and efficiency a concrete ring was placed at the top of the ground in each case. These silos are said to have proved satisfactory in every way and it is concluded that where the ground formation is suitable and there is no danger from seepage the pit silo is perfectly practical and is within the reach of many who can not afford a high silo.

Pneumatic water supply systems, H. C. RAMSOWER (*Ohio Farmer, 134 (1914), No. 13, pp. 1, 18, figs. 7*).—Working data and practical information are given regarding the installation and operation of pneumatic and hydro-pneumatic water supply systems for farm homes.

The hygiene of rural schools, T. CLARK (*Pub. Health Rpts. [U. S.], 29 (1914), No. 37, pp. 2364-2367, pl. 1*).—The results of inspections of a number of rural schools indicate a widespread need for instruction in rural sanitation. The author in the course of his investigations failed to find a single sanitary privy installed for the use of rural school children. In numerous instances no privy accommodations whatsoever were provided, and soil pollution in the neighborhood of the schoolhouse was evident.

RURAL ECONOMICS.

Population, general report, and analysis (*Thirteenth Census U. S., 1 (1910), pp. 1369, pls. 12, figs. 90*).—In this summary and analysis of the census data statistics relating to the rural population have been shown as to the number by age groups, by sex, and by nativity and parentage. The tables show the conditions by States and geographic divisions for 1910 and in most instances comparative data for earlier years.

Occupation statistics (*Thirteenth Census U. S., 4 (1910), pp. 615, figs. 9*).—This volume of the census contains statistical data showing by geographic divisions, States, and principal cities the number of persons engaged in specified occupations by sex, age, and nativity. The table following shows the comparative number of persons engaged in agriculture.

Number of persons engaged in all occupations and in agriculture, 1880-1910.

Census year.	Males.			Females.		
	All occupations.	Agriculture.	Relation of agriculture to all occupations.	All occupations.	Agriculture.	Relation of agriculture to all occupations.
	<i>Number.</i>	<i>Number.</i>	<i>Per cent.</i>	<i>Number.</i>	<i>Number.</i>	<i>Per cent.</i>
1910.....	30,091,564	10,760,875	35.8	8,075,772	1,807,050	22.4
1900.....	23,753,836	9,404,429	39.6	5,319,397	977,336	18.4
1890.....	19,312,651	8,378,603	43.4	4,005,532	769,845	19.2
1880.....	14,744,942	7,119,365	48.3	2,647,157	594,510	22.5

A wide variation was noted in the percentage of males engaged in agriculture in the various geographic divisions, ranging from 12.4 in the Middle Atlantic to 64.5 in the East South Central. All the geographic divisions, except the South Atlantic, East South Central, and West South Central, show less than 10 per cent of the females of all occupations engaged in agriculture, but in these three divisions, however, between 45 and 60 per cent of all females employed are so engaged. A large proportion of female agricultural workers are negro women of the South, who are engaged either on their home farms or work out in connection with cotton farming. The large increase in the number of females engaged in agriculture in 1910 is partially due to a difference in the manner of taking that census.

The eight-hour law—the standpoint of the farmer, G. H. HECKE (*Trans. Commonwealth Club Cal.*, 9 (1914), No. 7, pp. 430-437).—The author claims that if the eight-hour law as advocated in California should pass it would deplete the farms of white laborers and make a greater demand for oriental laborers, and that since the farmer's work is seasonal he and his help must work long hours at certain times of the year to secure the crops. Since the law prohibits overtime and establishes a severe penalty, California would have to compete with other States and countries where there is no eight-hour law. He also claims that since the law applies only to employees the bulk of extra work would fall upon the farmer and his family.

The relation between yields and prices, E. DAVENPORT (*Illinois Sta. Circ.* 177 (1914), pp. 8).—The author criticizes the views, which he states are generally assumed by many writers and speakers, that large yields are always profitable and the best farmers those who raise the largest crops; that large yields are a natural antidote for the high cost of living; that we should now copy the intensive methods of older countries; and that more capital is needed for the best results. He believes that it is relatively safe to invest capital freely upon the farm for the sake of correcting abnormal conditions and raising the yield to the normal, but that beyond that point, because of the law of diminishing returns, it will pay only when prices rise. As we approach this point by reason of increased demands, either the cost of food must rise or labor be greatly degraded, else the farmer can not afford to produce the increase needed. As population increases, therefore, but one alternative will present itself. Each human unit must become more efficient in production or it must deny itself much of what is now enjoyed.

Fundamental principles of cooperation in agriculture, G. H. POWELL (*California Sta. Circ.* 123 (1914), pp. 16).—The author maintains that the basis of

cooperative organization is men, not capital nor produce. The cooperative spirit is essential, and a cooperative organization of farmers must be founded upon economic necessity. Membership should be confined exclusively to producers, and be governed by the principle of "one man, one vote." Success depends primarily upon the loyalty and stability of its members and upon the efficiency of its management. He believes that a cooperative organization should be founded on a special crop, and the locality in which it handles the product should be comparatively restricted. Other principles to be observed are discussed, and some difficulties considered.

Rural cooperation and cooperative marketing in Ohio, 1913, C. F. TAEUSCH (*Ohio Sta. Circ. 141* (1913), pp. 17-39).—The author describes the various types of cooperative organization found within the State and points out their strength and weaknesses. Among the conclusions drawn are that the success of cooperation depends upon the directness of the business relationship between the producer and the consumer, and that failure has often resulted from an attempt to extend the organization over too large a territory before the local organization has been successfully developed. Other elements of success are a well-organized sales department and a good business manager. The absence of a penalty clause among the cooperative concerns has caused the members to feel free to sell their produce as they pleased, but the author believes that this difficulty might be solved by making every patron a stockholder, so that if he deserted the cooperative company his investment would become nonproductive.

Cooperative and community marketing of woodlot products, F. F. MOON (*Proc. Soc. Amer. Foresters*, 9 (1914), No. 3, pp. 303, 309).—The author claims that if the products of the small woodlot could be marketed at a good profit it would serve as an effective stimulus to reforestation. He suggests as a means of increasing the profit to the owner of small woodlots that there be established a system of cooperative marketing where aid would be given to the private owner from a central bureau, or a community market which may assume the form of a township wood market, or a subsidized millman who would receive support from a State forester in return for square dealing and liberal prices for stumpage.

The story of the growth of Elgin, C. F. CLASS (*Hoard's Dairyman*, 48 (1914), No. 9, pp. 224, 225, 247, figs. 4).—This article contains a historical description of the growth of the dairy industry about Elgin, Ill., and the function of the Elgin board in determining butter prices.

A corn-belt farming system which saves harvest labor by hogging down crops, J. A. DRAKE (*U. S. Dept. Agr., Farmers' Bul. 614* (1914), pp. 16, figs. 7).—The author outlines a system of farming whereby the harvesting of the crops is mostly performed by swine, thereby enabling one man to care for an extensive acreage in crops. The system calls for a four or five year rotation, whereby the first year consists of corn to be hogged off, the second year of corn to be cut and rye to be sown in the fall, the third year of rye and young clover hogged off and pastured, and the fourth year of clover and timothy which are hog pastured. If a fifth year is added, timothy and clover are pastured and then cut for hay.

It is claimed that by the use of this system 1 man and 3 horses, with a small amount of outside help, can cultivate 100 acres, that is, 20 acres to each phase in the rotation. The system demands that the swine be turned in to pasture the rye about April 10-15, into the clover May 1-15, and to harvest the rye about July 15, and the new corn crop about September 10. Under this system the larger hogs could be fattened off and sold the latter part of August. Rye and the hogging off of this crop offer a substitute for wheat, which has become unprofitable on many farms in the Middle West. This system has a tendency

to build up the soil and conserve the fertility and has given a satisfactory income on a number of farms.

Some things the prospective settler should know, T. F. HUNT ET AL. (*California Sta. Circ. 121 (1914), pp. 64, figs. 8*).—The authors have attempted to set forth what the prospective settler in California may expect as to average yields of crops, investment required for satisfactory income, and size of farms necessary to obtain this income. They outline a method of estimating the value of land, describe the various types of soil and climate, irrigation, the farm-labor problem, and give an imaginary example to illustrate how a man, who desires a certain gross income, may get started. Specialists have contributed articles on the growing of about 16 standard crops showing the important producing centers and describing the best methods of production.

Ownership of homes (*Thirteenth Census U. S., 1 (1910), pp. 1293–1366, figs. 2*).—This portion of the summary of census data regarding population shows the number of farm and other homes, and whether they are owned free, encumbered, or rented. This information is shown by geographic divisions and States. The following table shows the conditions of homes in the various classes:

Ownership of farm and other homes in the United States, 1890–1910.

Census year.	Per cent of total.							
	Farm homes.				Other homes.			
	Owued.	Rented.	Owued free.	Owued encumbered.	Owued.	Rented.	Owued free.	Owued encumbered.
1910.....	62.8	37.2	42.5	20.3	38.4	61.6	25.7	12.7
1900.....	64.4	35.6	44.5	19.9	36.2	63.8	24.7	11.5
1890.....	65.9	34.1	47.3	18.6	36.9	63.1	26.7	10.2

Agricultural conditions in Great Britain and Ireland, J. WILSON and H. WALLACE (*Des Moines, Iowa: Dept. Agr., pp. 16*).—This report is devoted principally to a description of the system of tenancy in the above countries. It was found that a large percentage of the land was cultivated by tenants and that the leases generally ran for a long series of years.

In England and Scotland the landlord has title to the land itself. He also owns the improvements which he and his ancestors put there, but there is a recognition of the right of the tenant to remove at the end of his lease (without damage to the interests of the landlord) any improvement he has been obliged to make, and especially of his right to any fertility to the land he may have made during his occupancy. Such a system has made it to the interest of the tenant to farm to the best of his ability and to the interest of the landlord to keep the tenant as long as possible and thus conserve the fertility of the land.

In Ireland the land became so high-priced that the Government, by a series of laws, began to purchase the estates of landlords and distribute them among the tenant class. These lands have been purchased at about 20 years' judicial rent and the tenant has been required to pay $3\frac{1}{2}$ per cent for $68\frac{1}{2}$ years, at the end of which time he and his heirs became owner of the landlord's interest. About 60 per cent of the land has already passed from landlord to tenant.

Agricultural statistics of Netherlands (*Dept. Landb., Nijv. en Handel [Netherlands], Verslag. en Meded. Dir. Landb., No. 4 (1914), pp. 134*).—This report contains statistical data showing the area and average production of

agricultural products for minor divisions for 1913 and for 10-year periods beginning with 1851, the number of farm animals for 1913 by minor geographic divisions and from 1804 to date for the country as a whole, and the production of butter and cheese for 1910 and 1912. Additional information is given regarding cooperative organizations for credit and the production and sale of agricultural products.

AGRICULTURAL EDUCATION.

Proceedings of the twenty-seventh annual convention of the Association of American Agricultural Colleges and Experiment Stations, edited by J. L. HILLS (*Proc. Assoc. Amer. Agr. Cols. and Expt. Stas.*, 27 (1913), pp. 298).—This is a detailed account of the proceedings, including the papers submitted, of the convention held at Washington, D. C., November 12-14, 1913 (E. S. R., 29, p. 601). In addition to papers noted or abstracted elsewhere in this issue it contains as the report of the bibliographer a bibliography of 128 publications on rural economics and sociology, 1906-1913 (pp. 26-39), a report of the committee on extension organization and policy which includes a statistical summary of agricultural extension carried on by the agricultural colleges for the year ended June 30, 1913, other reports, and the following addresses: Address of Welcome, D. F. Houston (pp. 19-23); Presidential Address, by E. H. Jenkins (pp. 63-68); Rural Credit, by J. L. Coulter (pp. 69-73); Agricultural Research in Europe and America, by W. H. Jordan (pp. 74-79); Marketing Farm Products, by C. J. Brand (pp. 80-87); The Relation of the Rural Organization Service to the Colleges of Agriculture, by T. N. Carver (pp. 87-92); The Relations Between the Federal Department of Agriculture and the Agricultural Colleges and Experiment Stations, by E. Davenport (pp. 121-133); The Status of the Military Department in the Land-Grant Colleges, by E. Orton, jr., et al. (pp. 172-186); How Can We Secure a More Serious Attitude on the Part of the Average Student Toward His Work, by E. E. Sparks (pp. 218-222); Securing a More Serious Attitude on the Part of Students, by H. C. Price (pp. 222-224); Student Character Records, by W. M. Riggs (pp. 224-227); The Organization of Station Administration Work, by W. H. Jordan (pp. 242-248); and Definitions and Lines of Demarcation in Research, Experiment, and Demonstrations, by J. F. Dugger (pp. 248-251).

Relation of the United States Department of Agriculture to the agricultural colleges and experiment stations, B. T. GALLOWAY (*Washington: Govt.*, 1913, pp. 6; *Proc. Assoc. Amer. Agr. Cols. and Expt. Stas.*, 27 (1913), pp. 117-121).—This discussion has been previously noted (E. S. R., 29, p. 603).

Report of the committee on instruction in agriculture, A. C. TRUE ET AL. (*Proc. Assoc. Amer. Agr. Cols. and Expt. Stas.*, 27 (1913), pp. 40-61).—This report deals with the subject of farm practice as a prerequisite to the degree course in agriculture and as a subject of instruction in the agricultural colleges. Information is given concerning farm practice requirements in agricultural colleges in foreign countries and in the United States, followed by a tabulated summary of data on farm practice in 47 agricultural colleges in this country and descriptions of some projects referred to in the discussions.

Instruction in pure science for agricultural students, C. E. BESSEY (*Proc. Assoc. Amer. Agr. Cols. and Expt. Stas.*, 27 (1913), pp. 213-217).—The author discusses the advantages and disadvantages of two somewhat opposing educational theories as to the relation of science to the different phases of agriculture. In the first theory "the teacher of agriculture, or any of its subdivisions, while teaching it should make the adjustment of his subject to the underlying sciences, referring to such sciences, but not requiring the student to have pur-

sued them," while in the second theory the teacher of agriculture "requires the student to have pursued the underlying sciences to such an extent as will make him familiar with those portions that immediately underlie agriculture, and on this foundation of science the agricultural teacher will build his instruction."

Definiteness of appointment and tenure, E. D. SANDERSON (*Proc. Assoc. Amer. Agr. Cols. and Expt. Stas.*, 27 (1913), pp. 203-210).—Data are presented showing the prevailing custom in manner of appointment and tenure of professors, assistant professors, and instructors as shown in 43 replies to a questionnaire sent to the presidents and deans of agriculture of the land-grant colleges.

The scale and adjustment of salaries and distribution of service in the college, station, and extension departments, R. L. WATTS (*Proc. Assoc. Amer. Agr. Cols. and Expt. Stas.*, 27 (1913), pp. 228-238).—A tabular statement is given, compiled from answers received from 30 colleges for the collegiate, station, and extension departments, and from 4 stations as such, showing a total of 1,878 individual staff members in the institutions reporting, of whom 19 per cent were engaged solely in experimental work, 35 per cent in teaching, 8 per cent in extension work, 23 per cent in experimental work and teaching, 2 per cent in experiment and extension, 3 per cent in teaching and extension work, and 10 per cent in experimental, teaching, and station work. A comparison of the figures for 14 institutions with staffs or faculties averaging 31 members and 7 institutions with an average faculty membership of 118 shows essential similarity except that the proportion of the total number engaged solely in experimental work is higher in the smaller colleges, while the proportion of the total number engaged solely in teaching is higher in the larger colleges. The distribution of service in relation to efficiency, research work with very limited service in other lines, and the apportionment of time and salaries are discussed.

A system of retiring allowances for land-grant institutions, E. DAVENPORT (*Proc. Assoc. Amer. Agr. Cols. and Expt. Stas.*, 27 (1913), pp. 187-196).—This paper outlines some of the reasons for establishing and maintaining a definite system of retiring allowances or "emeritus salaries," as a fundamental element in the administration of the agricultural colleges and experiment stations, and presents a tentative plan together with an estimate of its cost.

Report of special committee to study types of extension organization and policy in the land-grant colleges, W. D. HURD ET AL. (*Proc. Assoc. Amer. Agr. Cols. and Expt. Stas.*, 27 (1913), pp. 279-292).—The author analyzes the data received in replies from 28 institutions as to organization, administration, inter-departmental extension work, titles and methods for selecting extension men, direction of men and work, sources and expenditure of funds, salaries, correlation of extension, research, and teaching work, cooperative relationships in practice between the extension work of the colleges and other organizations, direct relationships of boards of trustees to the organization and direction of extension work, desirability of centering all extension work at the college, advisability of centralizing the work of the several divisions or colleges in an institution under the direction of one extension organization, extension publications, lecture and demonstration work, demonstration or model farms as a part of the work, and miscellaneous forms of extension work, opportunities given extension men for professional improvement, and plans for a long term policy. A summary and recommendations are given.

The organization of an extension service, H. J. WATERS (*Proc. Assoc. Amer. Agr. Cols. and Expt. Stas.*, 27 (1913), pp. 147-154).—In this paper the author attempts to lay down principles rather than outline a definite form of extension organization, discussing the need for the special extension teacher, present organization of the land-grant college, an extra-mural college, respon-

sibility for the teachings of the extension movement, separate organization and housing of the extension service, advisability of the extension people teaching college classes, who shall conduct demonstration work and make and judge exhibits at the fairs, and county agents.

Things the colleges should undertake to accomplish through its extension division, J. H. WORST (*Proc. Assoc. Amer. Agr. Cols. and Expt. Stas.*, 27 (1913), pp. 161-165).—In this discussion the author holds that needless drudgery may be avoided, waste eliminated, the premises beautified at trifling expense of money and labor, the business of farming modernized, systems of cooperation in labor as well as in buying and selling established, amusements provided for old and young alike, roads and schools improved, and a community spirit developed on a basis that will endear the social life to all its members if the extension workers will work to make every farm a laboratory and every home a nursery for inculcating the principles of better farming, better business, and better living.

Organization in a county or community for extension, G. I. CHRISTIE (*Proc. Assoc. Amer. Agr. Cols. and Expt. Stas.*, 27 (1913), pp. 260-264).—The author believes that whenever possible the policy of grouping the various lines of work in charge of a few organizations is to be preferred to dividing it among several bodies. It is seldom wise to disregard or disband established organizations in favor of new and untried forms, and usually better policy to attempt to bring all of these forces into one large federation for county-wide extension work. His idea of county organization and of the relations such organizations should bear to the extension service is given in tabular form and briefly discussed.

Problems confronting the agricultural colleges in their extension work and suggestions for meeting them, K. L. BUTTERFIELD (*Proc. Assoc. Amer. Agr. Cols. and Expt. Stas.*, 27 (1913), pp. 154-158).—In this paper the author expresses his views as to the relationships of the extension service to the experiment station, the agricultural survey work, college teaching, other public supported agencies like the boards of agriculture, education, and public health, voluntary associations in agriculture, the U. S. Department of Agriculture, and privately supported agencies. In his opinion the fundamental principle that must ultimately be accepted, namely, that the agricultural college through its extension service is the main agricultural agency of the State, will solve most of the difficulties in these relationships.

Cooperation with other agencies in agricultural extension, M. S. McDOWELL (*Proc. Assoc. Amer. Agr. Cols. and Expt. Stas.*, 27 (1913), pp. 252-255).—The author discusses briefly cooperation in agricultural extension with governmental or official agencies, including national and state activities, and unofficial agencies which may be divided into two groups—those which are directly agricultural in character and aim and those which are commercial but may have an indirect relation to agriculture.

The preparation of extension workers, K. L. HATCH ET AL. (*Proc. Assoc. Amer. Agr. Cols. and Expt. Stas.*, 27 (1913), pp. 272-279).—This, the first report of the committee, discusses the results of an inquiry based on replies received from 43 of the 48 state agricultural colleges as to the professional and technical preparation and the practical experience that an extension worker should have before entering the service, the need for further special preparation of those engaged in distinct lines of extension activity, such as boys' and girls' club work, county agent work, and various other special lines of service, the course of study best adapted to the preparation of extension workers, the administration of the extension service by the agricultural colleges, and the various lines of work offered.

Comments on European agricultural institutions, A. C. TRUE (*Proc. Assoc. Amer. Agr. Cols. and Expt. Stas.*, 27 (1913), pp. 106-111).—The author calls attention to the fact that in recent years the higher agricultural institutions in Europe have been made more strictly and fundamentally institutions of real university grade, through the improvement of their equipment and facilities, an increase in the size of farms, the assembling of collections of farm machinery, enlarging the scope and extent of the curriculum with a more definite application to practical agriculture, and increasing the faculty. There is not in Europe entire unanimity as to the desirability of making the agricultural colleges departments of the universities.

As regards secondary agricultural schools a number of countries have a much more complete system than we have as yet in this country and the tendency is to increase their number and make them more efficient. They are still, however, largely for the peasant classes. In a general way these schools may be divided into two classes, (1) those in which great stress is laid on theoretical instruction, and (2) those in which the emphasis is laid on practical instruction. With reference to Denmark, "what they have done is well adapted to their conditions and to a small country where the agricultural industries are of a limited variety; but it would not do at all in the United States, except perhaps as one phase of the work where short courses of study are desired in the secondary schools."

The author finds that one of the developments along the line of elementary instruction in agriculture, to which much attention is now being given in European countries, is the continuation classes which are held on Saturdays or in the evenings. Attendance on these can to some extent be made compulsory by village authorities in Germany.

A brief account is also given of the recent developments with reference to a system of agricultural education in England.

School lessons on corn, C. H. LANE (*U. S. Dept. Agr., Farmers' Bul.* 617 (1914), pp. 15, figs. 5).—This supersedes Farmers' Bulletin 409 (E. S. R., 24, p. 92), and consists of 12 lessons arranged topically with practical exercises and references. A suggestive program for observing Corn Day in the school is also given.

Farm demonstration work, boys' corn club work, and girls' canning club work, F. MUTCHLER (*Bien. Rpt. Bur. Agr., Labor, and Statis. Ky.*, 20 (1912-13), pp. 74-78, pls. 2).—A brief statement by the state agent as to the history and development, together with data on results and progress, of the Farmers' Cooperative Demonstration Work and boys' and girls' club work in agriculture, is given.

Plan of organization and administration of home economics clubs and women's auxiliary clubs of county farmers' institutes, MRS. C. L. MARTIN (*Ky. Dept. Agr., Labor and Statis. Bul.* 2, pp. 8).—This bulletin suggests how Kentucky women may organize themselves into clubs and become a part of the county farmers' institute.

Home makers' clubs of Missouri (*Missouri Bd. Agr. Mo. Bul.*, 12 (1914), No. 1, pp. 46, figs. 7).—Suggested programs for meetings are given, together with other similar data and a bibliography of literature bearing on home topics suitable for club study.

NOTES.

Arkansas University and Station.—DeForest Hungerford, instructor in soils in the University of Minnesota and assistant in agricultural chemistry in the station, has been appointed assistant professor of agronomy and assistant agronomist.

Purdue University and Station.—Recent appointments include R. A. Lamson, of the Idaho University and Station, as instructor in dairying and the following assistants: O. H. Anderson, in dairying; G. L. Ogle and R. O. Bausman, in creamery inspection; S. S. Cromer, in education; C. H. Clink, in serum production; L. R. George, in animal pathology; T. W. Harvey, in county agent work; W. E. Lommel, in horticulture; W. R. Skelly, in farm crops and agricultural botany; W. L. Elser, of the Ohio Station, in farm management demonstrations; L. S. Robertson, in farm efficiency; F. M. Shanklin, in young people's club work; and L. L. Jones, in poultry work.

Massachusetts College and Station.—Estimates for 1915 appropriations have been submitted for \$313,300 for maintenance and additional appropriations as follows: Microbiology laboratory, \$67,500; for the completion of the agricultural building, \$122,500; new dormitory, \$40,000; enlargement of the power plant, \$30,000; and minor improvements, \$10,000.

The trustees have authorized the beginning of investigations in microbiology, in which projects connected with milk and soils are to be taken up, and agricultural economics. The employment of an assistant in the veterinary department, to deal especially with the problems connected with bacillary white diarrhea and contagious abortion of cows, has also been authorized.

North Dakota College.—J. R. Keithley, of the Bureau of Animal Industry of this Department, has been appointed professor of dairying.

Ohio State University.—A section of greenhouses, 30 by 100 feet, is under construction, and will be followed by two vegetable houses, each 45 by 250 feet, making about 8,000 square feet under glass. The entire greenhouse will be divided into a number of special compartments, including a palm house, a head house, a vegetable house, and a students' laboratory.

A combined 6-year agricultural veterinary course is under consideration. The first 3 years would be spent in the college of agriculture and the remainder in the college of veterinary medicine, degrees being granted from both colleges.

A state biological survey, suggested by the Ohio Academy of Science, is being undertaken with a state appropriation of \$2,500, a number of the colleges of the State cooperating. The preparation of duplicate material and separate collections for the colleges and other educational institutions is the primary feature of the work.

Pennsylvania College and Station.—Dr. H. P. Armsby, director of the Institute of Animal Nutrition, has been relieved of all undergraduate instruction and will devote his entire time to research in animal nutrition and to advanced graduate instruction.

Earl L. Moffit has resigned to accept a position with the Office of Farm Management of this Department.

South Dakota Station.—Wilson Cramer, a 1914 graduate of the University of Missouri, has been appointed assistant in animal husbandry.

Wisconsin University and Station.—The university has accepted offers from farmers of Ashland and Bayfield counties to erect on the substation farm at Ashland a building suitable for short courses and similar gatherings, at a cost of \$1,000. When not in use for these purposes, the building will be available for experimental work.

American Society of Agronomy.—The seventh annual meeting of this society was held in Washington, D. C., November 9 and 10, 1914, with a large attendance and marked interest.

The address of the president, C. V. Piper, was delivered at the joint session with the Society for the Promotion of Agricultural Science, as previously noted. Its title was *Fundamental Principles in Agronomy*, and eighteen generalizations were formulated and discussed. These principles were as follows: (1) Every crop plant has a definite range of adaptations or reactions as regards climate and soil; (2) tillage tends to increase yields; (3) shallow tillage conserves soil moisture; (4) rate of seeding or distance of spacing affects yield; (5) depth of planting affects stand and therefore may affect yield; (6) time of seeding affects yield; (7) quality of seed affects yield; (8) rotative cropping tends to increase or to maintain yields, single cropping tends to reduce yields; (9) mixed seedings tend to increase yields; (10) fertilizers (nearly all common substances) tend to increase yields; (11) the nitrogen content of the soil is most cheaply maintained by keeping up the supply of humus and especially by growing legumes, which alone of crop plants can utilize atmospheric nitrogen; (12) productivity is approximately maintained by feeding crops to animals and returning the manure to the soil; (13) selecting the best plants tends to improve the breed; (14) hybridization tends to stimulate vigor; (15) plants introduced from their original to a new and similar environment often tend to become aggressive; (16) thinning buds by pruning or otherwise tends to increase the size of the remaining resultant flowers and fruits; (17) vegetative vigor and reproductive vigor are mutually antagonistic; and (18) dwarfing of perennial plants may be secured by budding or grafting on stocks not wholly congenial.

Professor Piper pointed out that this is the first attempt to enumerate these principles, although only the one relating to the use of nodule bacteria is clearly the product of the last 50 years. In conclusion he referred to the difficulty of drawing any but very broad generalizations because of the differing adaptations of plants, and maintained that "the best hope of progress in agronomy lies not in the search for broad generalizations, but in a much more intensive study of the environmental relations of every important plant cultivated."

The success with which the unit-acre platting system is being applied in Texas was described by B. Youngblood and A. B. Conner. Under this system the same kind of crop is assembled within the unit-acre, which may be divided into plats of suitable size to accommodate the requirements of the several experiments in progress at the time.

C. B. Lipman discussed the solids of smelter wastes and plant growth, indicating their value as plant food when applied in proper quantities.

In discussing the origin of "niter spots" in certain western soils, R. Stewart and W. Peterson presented data to show a mineral origin caused by water movement in the soil and evaporation from the surface, in distinction from the bacterial origin held by some investigators.

Experiments on the effect of different methods of preparing a seed bed for winter wheat on yield, soil moisture, and nitrates, were described by L. E. Call. He pointed out the value of early preparation, whatever the method.

G. N. Coffey, reporting for the committee on soil classification and mapping, presented a scheme of classification for use throughout North America based on five grand factors, with their several subdivisions, for further consideration and discussion. This scheme is as follows: I, Precipitation and humidity (Soil Region); (a) humid, (b) semiarid, (c) arid. II, Dynamic agencies (Soil Province); (a) weathering, (b) biological processes, (c) gravity, (d) aqueous agencies, (e) aeolean, (f) glaciation. III, Lithology (Soil Group); (a) acid crystalline rock, (b) basic crystalline rocks, (c) sandstones, quartzites, shales, and slates, (d) lime rocks, including marl, limestone, and marble. IV, Specific characters and conditions (Soil Series); (a) color, (b) drainage, (c) lime carbonate, (d) organic matter, (e) relation of soil to subsoil. V, Texture (Soil Type); (a) sand, (b) sandy loam, (c) loam, (d) silt loam, (e) clay loam, (f) clay.

G. S. Fraps discussed soil moisture relations and the relation of chemical composition to soil fertility. A paper on the naming of varieties, by E. G. Montgomery, was also presented.

The officers elected for the following year included as president, C. E. Thorne, of Ohio; vice-presidents, L. J. Briggs, of this Department, and Alfred Atkinson, of Montana; secretary, C. W. Warburton, of this Department; and treasurer, George Roberts, of Kentucky.

Association of Feed Control Officials.—This association held its sixth annual meeting at Washington, D. C., November 13 and 14, 1914. Following an address by the Assistant Secretary of Agriculture, H. J. Waters spoke on the deficiencies of corn as a feed, and H. W. Wiley on Ethical Advertising of Cattle and Poultry Foods and Remedies. The Possibilities of Damaged Feeds Producing Disease in Animals was discussed by J. S. Buckley, and the Deterioration of Grains in Storage and Transit, by J. W. T. Duvel. R. W. Chapin spoke on some of the feed manufacturers' problems.

The association adopted a new constitution and by-laws. New definitions were accepted for several flaxseed products, but no action was taken as to the proposed federal feeding stuffs inspection law.

Officers were chosen as follows: President, H. B. McDonnell, of Maryland; vice-president, R. E. Stallings, of Georgia; secretary-treasurer, L. A. Fitz, of Kansas; and executive committee, W. J. Jones, of Indiana, J. K. Haywood, of this Department, and S. K. Johnson, of Ohio.

Association of Seed Analysts of North America.—The annual meeting, held in Washington, D. C., November 12 and 13, 1914, dealt, as usual, mainly with seed inspection, laboratory apparatus and methods, and seed laws. Papers were also presented on The Necessity of Standardization of Methods, by Edgar Brown, The Weed Content of Seeds, by L. H. Pammel, and The Germination of Seeds Buried Ten Years, by W. L. Goss.

W. L. Oswald, of Minnesota, was elected president; E. D. Eddy, of Ottawa, Canada, vice-president; and J. P. Helyar, of New Jersey, secretary-treasurer.

EXPERIMENT STATION RECORD.

VOL. XXXII.

ABSTRACT NUMBER.

No. 3.

RECENT WORK IN AGRICULTURAL SCIENCE.

AGRICULTURAL CHEMISTRY—AGROTECHNY.

The simpler natural bases, G. BARGER (*London, New York, Bombay, and Calcutta, 1914, pp. VIII+215*).—The contents of this volume, which is one of the well-known series of monographs on biochemistry edited by R. H. A. Plimmer and F. G. Hopkins, are as follows: Amins derived from protein; ω -amino acids and other bases containing a carboxyl group; betains; cholin and allied substances; creatin, creatinin, glycocycin, and guanidins; adrenalin; bases of unknown constitution; and practical chemical methods and details, (a) general methods for the separation and isolation of bases, (b) special methods—properties of individual bases and of their salts.

A very large bibliography is appended.

Nucleic acids.—Their chemical properties and physiological conduct, W. JONES (*New York, Bombay, and Calcutta, 1914, pp. VIII+118*).—Despite the fact that the field of nucleic acids is one of the best understood in biological chemistry, this work constitutes the first separate treatise on the subject. Its contents are as follows: Thymus nucleic acid, yeast nucleic acid, the physiological conduct of nucleic acids, preparation of thymus nucleic acid, the analytical chemistry of the purin derivatives and of the pyrimidin derivatives, preparation of thymine and cytosine from thymus nucleic acid, preparation of uracil and cytosine and of guanylic acid and guanosine from yeast nucleic acid, and demonstration of the purin ferments.

An extensive bibliography is appended. This volume is another of the well-known series of monographs on biochemistry referred to above.

The decomposition of sugar in the living cell, C. OPPENHEIMER (*Naturwissenschaften, 2 (1914), Nos. 3, pp. 49-52; 4, pp. 78-82*).—This deals minutely with the subject from the standpoint of both animal and plant physiology.

About plant tallows, H. WAGNER and J. B. LAMPART (*Ztschr. Untersuch. Nahr. u. Genussmittel, 27 (1914), No. 10, pp. 731-733*).—A fat declared as plant fat to the customs authorities and said to originate in the East Indies had an odor reminding one of beeswax, a yellow color, and a brittle, hard consistency. The tallow contained many particles of wood and bark. When melted the fat had a still more pronounced honey-like odor and a tallowy taste. Tests for sesame and cotton-seed oil were negative, and Bellier's reaction did not give a test for plant fats.

The refractive index of the fat at 40° C. was 43.7, melting point 38.75° C., solidifying point 29.3°, acidity degree 17.25, acid number 9.6, ester number 197.9,

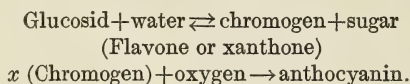
saponification number 207.5, Reichert-Meissl number 0.11, and iodine number 37.1. The fatty acids gave a refractive index of 32.1, melting point 54.8°, solidifying point 52.05°, acid number 211.4, average molecular weight 265.4, and iodine number 41.4. The unsaponifiable material was present to the extent of 0.25 per cent, but phytosterol acetate could not be obtained. After purification with petroleum ether and attempted recrystallization from alcohol an amorphous mass was obtained which gave a slight Salkowski and Liebermann reaction.

The fatty acids, separated as lead salts after repeated recrystallization from benzol, were decomposed with hydrochloric acid, and after repeated recrystallization from alcohol a constant melting point of from 62.9 to 63° C. was obtained. The neutralizing figure was 219.1 and the average molecular weight 256.07, essentially that of palmitic acid. The amount of solid acid present was from 55 to 66 per cent.

The refraction number of the liquid fatty acids at 40° was 40.6 and the iodine number 85.7. The fat corresponded to Malabar tallow or Chinese tallow from *Stillingia sebifera* and various varieties of the *Jatrophas*.

The flower pigments of *Antirrhinum majus*.—I, Method of preparation, MURIEL WHELDAL (Biochem. Jour., 7 (1913), No. 1, pp. 87-91).—The author has previously (E. S. R., 25, p. 324) made suggestions as to the nature of the chemical reactions involved in the formation of anthocyanin.

The yellow coloring matters of plants are said to be present largely as glucosides, some, or probably all, of the hydroxyl group being replaced by sugar. The reactions involved in the formation of anthocyanin are represented, generally considered, as follows:



"The first reaction may be regarded as controlled by one or more glucosid-splitting enzymes and it is conceivable that specific enzymes may act on hydroxyl groups in different positions. When certain hydroxyl groups (position to be determined) are free from sugar, oxidation may take place at these points, or possibly condensation, or both, with the formation of anthocyanin. The residual hydroxyl groups in the anthocyanin molecule would probably be replaced by sugar, and hence the anthocyanins would occur as glucosides. There is evidence that the second reaction may be brought about by an oxidase system."

Investigations conducted for the purpose of testing the first of these hypotheses with regard to the nature of the pigment in *Antirrhinum* resulted in devising a method for obtaining the pigment in a solid form. The pigments, dissolved in water, are precipitated with solid crystalline lead acetate until no further material is thrown down. Most of the supernatant liquid is decanted from the precipitate after a few hours and the residue is filtered through a Buchner funnel with the aid of the filter pump. The lead salts of the pigment are then decomposed with 5 to 10 per cent sulphuric acid. The insoluble lead sulphate is filtered off and the filtrate therefrom contains the pigments as glucosides in a dilute sulphuric acid solution. The solutions are boiled for several hours under a reflux condenser, which results in a hydrolysis of the glucosides and a deposition of the pigments. The pigment separated by filtration is dried, after washing, over sulphuric acid.

The following varieties of *Antirrhinum* have been extracted: Ivory, yellow, ivory tinged with magenta, magenta, crimson, rose doré, and bronze. The ivory and yellow contained in a crude pigment in association with magenta was soluble in warm ether, though not readily. The ivory and yellow could

be separated by a fractional crystallization from alcohol and ethyl acetate, but not in a pure state.

"Of the known flavones, the ivory pigment bears most resemblance to apigenin in properties and acetyl derivative. The yellow pigment crystallizes in plates from dilute alcohol but was not obtained in the pure state; melting point 290 to 300°. After extraction with ether for several weeks, the magenta pigment was obtained free from yellow. It crystallizes, but not well, from a mixture of alcohol and ethyl acetate. It decomposes without melting when heated to 340°."

The flower pigments of *Antirrhinum majus*.—II, The pale yellow or ivory pigment, MURIEL WHELDAL and H. L. BASSETT (*Biochem. Jour.*, 7 (1913), No. 5, pp. 441-444, fig. 1).—This is a continuation of the work noted in the abstract above.

"It has been previously suggested that ivory contains a chromogen of the nature of a flavone, from which the red and purple anthocyanins are formed by stages of oxidation or polymerization or both. Also that the pigment of the yellow variety and of the yellow patch on the palate of all varieties (except white) is due to a second, more deeply colored flavone. Microscopic examination and microchemical tests showed that anthocyanin and yellow pigments are mostly limited to the epidermis of the corolla, while the inner tissues contain the ivory chromogen. It is obvious, therefore, that all crude extracts of entire flowers will contain two or more pigments."

The purification of the crude pigment from the crimson and bronze varieties, although no analyses have been made of them, led to the conclusion that the colors of the varieties mentioned in the abstract above are merely due to a mixture of magenta and yellow and red and yellow, and not to specifically different pigments.

"The constituent pigments of the varieties may be thus expressed: Yellow (ivory, yellow); ivory, lower lip (ivory, yellow); ivory, upper lip (ivory); yellow tinged bronze, bronze, ivory tinged rose doré, rose doré (yellow, ivory, and red); yellow tinged crimson, crimson, ivory tinged magenta (yellow, ivory, magenta); magenta, lower lip (yellow, ivory, magenta); magenta, upper lip (ivory, magenta)."

The first deposits from yellow ether extracts when crystallized from alcohol gave, at first, deposits having a melting point of from 336 to 340° C., and in five cases the acetyl products were in the form of needle-shaped crystals. Analyses of acetyl and benzoyl derivatives of the pigments led to the conclusion "that the ivory pigment is apigenin, and that it is present in each of the main classes of varieties of *Antirrhinum* with the exception of the white. In the plant, apigenin exists undoubtedly as a glucosid, though the kind of sugar and the number of molecules attached still remain to be ascertained.

"It appears possible that the deeper yellow pigment may prove to be a flavone, similar in constitution to apigenin, but deeper in color owing to the presence of an additional hydroxyl group."

Lycopersicin, the red pigment of the tomato, and the effects of conditions upon its development, B. M. DUGGAR (*Wash. Univ. [St. Louis] Studies*, 1 (1913), I, No. 1, pp. 22-45).—As the chief pigment of the tomato has been shown (*E. S. R.*, 22, p. 609) to be distinct from carotin, the adoption of the name lycopersicin is suggested. The absorption spectra of carotin and lycopersicin are distinct. The latter pigment occurs in the mature fruit in the form of needle-shaped crystals, but it may also be present as narrow, elongated bars or bacilloidal granules, and possibly in irregular forms. So far as is known lycopersicin does not occur in normal plastids and is found only in crystalline or

semicrystalline condition. "Besides the occurrence of lycopersicin in crystalline form, carotin occurs as granules outside of the plastid in the ripening red tomato, and one or more of the orange pigments occur in the fatty oils of many fungi, and possibly in certain fruits, the detailed evidence of which can not be presented here."

In attempting to ripen quickly some tomato fruits which were gathered green, the fruits available were roughly divided into three lots, one of which was placed near a south window in a room kept moderately warm both day and night; a second lot was wrapped in black paper and placed in a locker in the laboratory where the temperature was usually 20° C.; and the third lot was incubated at a temperature of 35°.

After the lapse of a week, about half of the fruits near the south window had reddened well. Those at a moderate temperature, and in complete darkness in the locker, however, gave a larger number of ripe fruits, also with higher color, than the first lot. The incubator fruits showed very little reddening, but rather a preponderance of orange and yellow pigment. It was therefore obvious that the chemical effects of light were unimportant in the reddening process.

As to the affects of higher temperatures, "the red pigment of tomatoes, lycopersicin, is partially or completely suppressed when green fruits are ripened at a temperature of 30° or above, a yellow, orange, or orange red coloration resulting. The inhibition of reddening is proportional to the temperature (between 30 and 37°) increase, and inversely related to the age of the fruits used. The factors for reddening are not destroyed by high temperature, and a return of the fruit to favorable conditions permits rapid pigmentation.

"Fruits maintained in an oxygen-free atmosphere fail to redden at a normal ripening temperature. Fruits of the red peppers ripen normally at high temperature, but the red arils of *Momordica* seem to follow the behavior of the tomato. The chief pigments of red peppers and of the arils of *Momordica* exhibit the absorption bands of lycopersicin. In the tomato lycopersicin formation follows the destruction of the chlorophyll, also certain other changes, suggesting an increased permeability of the cell structures. Lycopersicin suppression at high temperature may be related to decreased acidity, but unknown factors are concerned."

"A study of the oxidase and peroxidase content was also undertaken, but so far as the determinations have been carried, there is no correlation between oxidase content and lycopersicin development."

The effect of certain conditions upon the acidity of tomato fruits, B. M. DUGGAR and M. C. MERRILL (*Ann. Missouri Bot. Gard.*, 1 (1914), No. 2, pp. 237-240).—In the work reported in the abstract above reference is made to the possible relation the total acid content of tomato fruits ripened at 30° C. or above may have in hindering the development of pigment (lycopersicin) at that temperature. "It was determined that the 'total acidity for green, ripening, and ripe fruits, grown under the same conditions, is unexpectedly uniform, amounting to 0.57 to 0.58 per cent citric acid.' The fruits just referred to were of the same variety picked at the same time. The tests were made by pulping thoroughly a weighed quantity of the tissue (15 gm.), diluting with 150 cc. distilled water, employing for each titration 25 cc. of this solution diluted with distilled water to 50 cc., and titrating with tenth-normal NaOH, using phenolphthalein as indicator.

"There were no marked differences between the green and ripe stages within the variety; yet the acidity of the green fruits of the red varieties in these tests is somewhat higher, while the acid content of the green fruits of the

one yellow variety tested is somewhat lower. Fruits of Dwarf Stone, Truckers Favorite, Red Peach, Yellow Peach, and Yellow Pear, which were picked green and ripened in the incubator at 32 to 33° C. (10 to 22 days), exhibit a higher acid content than either those ripened on the vines or those ripened at the temperature of the laboratory. There are considerable differences in the acidity of varieties, but judging from the results of these tests the normally ripened fruits of yellow varieties commonly contain as much acid as those of red varieties."

The tests show no relation between pigmentation and total acidity.

The nature, value, and limits of biological water analysis, A. THIENEMANN (*Ztschr. Untersuch. Nahr. u. Genussmtl.*, 27 (1914), No. 1-3, pp. 273-281).—Biological water analysis is defined as the judgment of the chemical composition of a water on the basis of its fauna and flora. The topics are discussed from various aspects and compared with the results obtained in the chemical examination of water.

The microscopy of drinking water, G. C. WHIPPLE (*New York and London, 1914, 3. ed. rewritten and enl., pp. XXI+409, pls. 26, figs. 73*).—This is a third and enlarged edition of this work. The first part of the work has been rewritten and several new chapters have been added. The most important chapters are on the copper treatment of water; the stripping of reservoir sites; the purification of algæ-laden waters; and the use of the microscope and photomicrography (by J. W. M. Bunker).

Report of committee [of the fertilizer chemistry division] on phosphoric acid, G. FARNHAM ET AL. (*Jour. Indus. and Engin. Chem.*, 6 (1914), No. 6, pp. 513, 514).—This is a résumé of the work done by the committee of the fertilizer section of the American Chemical Society since its organization.

Triammonium citrate, R. A. HALL (*Jour. Amer. Chem. Soc.*, 37 (1915), No. 1, pp. 208-216).—"Triammonium citrate can be obtained readily and easily as a stable compound by the passage of anhydrous ammonia gas into citric acid dissolved in an anhydrous solvent. The best solvent for this purpose is absolute alcohol heated to its boiling point. The yield of triammonium citrate is quantitative. Ninety-five per cent alcohol may be used, but the yield is not quantitative.

"The salt is a stable, crystalline substance. Analyses show it to have the composition represented by the formula $(\text{NH}_4)_3\text{C}_6\text{H}_5\text{O}_7$. It reacts alkaline to rosolic acid. It is exceedingly soluble in water and can not be recrystallized from its water solution. Precipitated, in the cold, from an aqueous solution by addition of alcohol an unstable crystalline form of the salt is obtained.

"From practical tests in laboratories where daily analyses of fertilizers are made it has been shown that the salt lends itself readily to the making of solutions of 1.09 specific gravity at 20° C.; that this solution of normal ammonium citrate gives, in parallel phosphoric acid determinations, results practically identical with the most carefully prepared 'neutral' ammonium citrate solutions and can, therefore, well be substituted."

About cholesterol and its estimation in fats, M. KLOSTERMANN and H. OPITZ (*Ztschr. Untersuch. Nahr. u. Genussmtl.*, 27 (1914), No. 10, pp. 713-723).—This work was done for the purpose of determining the form in which cholesterol is present in the usual edible fats and the proportions in the free and combined state.

In solid animal fats (lard, butter, beef tallow, mutton tallow, goose fat, oleomargarin, and human fat) cholesterol occurs in the free state. In cod liver oil, however, a number of esters are present which contain about one-half of the total cholesterol.

As to the presence of plant fats in supposedly animal fats the question is propounded whether phytosterol is present in a free state like cholesterol. Other investigations have shown that the phytosterols exist chiefly in ester combinations in plant fats and oils; consequently when these fats are present in animal fats saponification is necessary for their determination. The digitonin method gives higher results than Bömer's method.

The results of the investigation on the quantitative determination of phytosterol will be reported on later.

Method for determining extremely small quantities of boron in organic substances, G. BERTRAND and H. AGULHON (*Ann. Falsif.*, 7 (1914), No. 64, pp. 67-69, fig. 1).—In this method the length of color obtained by capillary attraction, etc., on strips of turmeric paper placed in a receptacle containing the solution to be tested and hydrochloric acid is noted.

Rapid estimation of phosphoric acid in baked goods, etc., L. SOBEL (*Schweiz. Wchnschr. Chem. u. Pharm.*, 51 (1913), No. 45, pp. 677-679; *abs. in Chem. Ztg.*, 38 (1914), No. 26, *Repert.*, p. 116).—Twenty-five gm. of well-dried and finely pulverized goods is rubbed up three successive times with 100 cc. of 96 per cent alcohol and filtered from the residue. The residue is then washed with alcohol until a total bulk of 300 cc., inclusive of the original extracts, is obtained. An aliquot of the upper clear fluid is evaporated carefully with from 2 to 3 gm. of magnesium chlorid and 3 gm. of sodium nitrate, and then ashed and the ash taken up with dilute hydrochloric acid. The phosphoric acid is determined in the filtrate as magnesium ammonium phosphate, etc.

A study of the methods for the determining of sulphur dioxid in dried fruits, M. E. JAFFA (*California Sta. Rpt. 1914*, pp. 131-138).—On reviewing the literature on the determination of sulphur dioxid in dried fruits the data found were too inadequate to enable the analyst to obtain correct and duplicate results. A study was made with apricots, peaches, pears, nectarines, prunes, and raisins, for the purpose of obtaining an adequate procedure for this work, and considered the following points: Precautions against extraneous sulphur, amount of sample to be used, amount of distillate, number of distillations necessary, number of absorption jars, nature of the oxidizer, quality of the carbon dioxid, and amounts of other reagents.

"Sulphur dioxid determinations in fruits are now being made according to the following method: Side neck 500 cc. distillation flask with a cork stopper, fruit finely macerated and thoroughly mixed, 8 gm. sample placed in flask, 20 cc. 20 per cent phosphoric acid added, 175 cc. distilled water added to contents of flask; 500 cc. Dreschel absorption jar connected to condenser with as short rubber connection as possible, inlets bent vertically for direct connection with vertical spiral condenser, 100 cc. solution of 20 gm. per liter potassium bromid, saturated with bromin, and 10 cc. 10 per cent sodium carbonate solution used in jar for absorbing medium; sodium bicarbonate used in second 500 cc. Dreschel absorption jar to catch volatile bromin; current of pure carbon dioxid gas passed through the whole apparatus. Distill with medium flame until about 180 cc. have passed over or until the fruit in the distilling flask is in pasty condition. Transfer distillate to 600 cc. Jena beaker, add 5 cc. concentrated hydrochloric acid, and evaporate to about 5 or 10 cc. on electric hot plate in clean hood. Take up with hot water, transfer to 150 cc. beaker, heat to boiling. Precipitate with few drops of barium chlorid. Leave in warm place overnight, filter, wash with hot water, burn, and weigh. The method as given thus in detail gives very satisfactory results. Almost perfect blanks are obtainable at will and duplicate and concordant results are the rule."

Phosphomolybdic acid as a reagent for the chemical and microchemical detection of adulteration in saffron, A. VERDA (*Chem. Ztg.*, 38 (1914), No. 30, pp. 325-327).—Saffron adulterated with drugs having microscopic characteristics similar to saffron and others having only similar coloring powers were studied.

When treated with a solution of phosphomolybdic acid saffron gives a beautiful green color. The test may be used microchemically, and thereby differentiates saffron from other substances. The reaction is said to be dependent upon crocin, a glucosid present in saffron.

The estimation of tannin in cider, C. W. SPIERS (*Jour. Agr. Sci. [England]*, 6 (1914), No. 1, pp. 77-83).—The various methods in use by chemists and botanists are criticized, especially those for determining tannin in cider. The use of fat-free casein to remove the tannin is recommended since it removes nothing else.

"Although it was found that the strychnin method of Trotman and Hackford [*E. S. R.*, 17, p. 530] is not accurate in the case of gallotannic acid, the tannin in cider is quantitatively precipitated by strychnin after careful neutralization. This is shown by the fact that there is a parallelism between the results obtained by this method and by the permanganate titration method; although in the absence of a method of quantitative precipitation of a standard gallotannin-strychnin compound, the strychnin precipitate results can not be expressed as gallotannin comparably with those of permanganate titration."

The amount of tannin removed is determined by the loss in permanganate value on titration. The solutions of tannins studied lost their tannin on shaking 50 cc. with 1 gm. of casein for 15 minutes. The permanganate solution was studied with various commercial tannins and 1 gm. of ammonium oxalate was found to be equivalent to 0.4648 gm. of tannin.

"The preparation of the tannin of apples is now being undertaken, so that it is hoped to standardize both the permanganate solution and the strychnin precipitate by the pure apple-tannin itself." The results of analyzing ciders, healthy and sick, and mostly of the bitter-sweet variety, are presented.

Minimal content of total nitrogen of milk, A. KLING (*Ann. Falsif.*, 6 (1913), No. 56, pp. 340-342; *abs. in Chem. Ztg.*, 38 (1914), No. 26, *Repert.*, p. 116).—The method proposed by Roy and the author for the detection of adulterated milk is considered accurate by Vuafart (*E. S. R.*, 31, p. 810), who, however, believes that the total protein content of milk should be taken as 29 gm. per liter and of fat as 30. The author thinks that the figures proposed may be correct for the north of France, but that in the Department of the Seine and the adjacent departments materially higher values prevail.

The determination of the titer of arsenite solutions, E. DEISS (*Chem. Ztg.*, 38 (1914), No. 39, pp. 413-415).—Iodin solutions containing iodates may under certain circumstances yield erroneous figures for the titer of an arsenite solution. A method is suggested for preventing this, namely, by adding acid to destroy the iodate formed. By the use of a permanganate solution of known strength, however, reliable figures may be obtained in a short time without doing this.

Vinegar making, F. T. BIOLETTI (*California Sta. Rpt.* 1914, p. 194).—Many complaints have come to the station regarding failures to obtain vinegars of standard strength and quality from apparently good raw material. Imperfect fermentation seemed to be the cause of most of the trouble. A table is presented which gives the results of fermenting apple juice with pure yeast and sulphurous

acid as compared with the old spontaneous fermentation method which is usually employed. The pure yeast and sulphurous acid process gave much more alcohol than the natural fermentation. The natural fermentation showed the presence of detrimental bacteria; the other did not.

Manufacture of unfermented grape juice in California, W. V. CRUESS and C. J. HINTZE (*Jour. Indus. and Engin. Chem.*, 6 (1914), No. 4, pp. 302-304).—The present output of unfermented grape juice in California is estimated at from 80,000 to 100,000 gal. per year. The present methods for preparing and bottling grape juice are considered, and various technical hints are included in the text. In addition the results of experiments made during 1912 and 1913 are reported upon.

"In view of these tests it is recommended that the process of grape juice manufacture be modified to conform to the following outline: Use a mixture of ripe grapes to give flavor with grapes of high acid to remedy the lack of acid in the ripe grapes. Add 8 to 12 oz. of potassium metabisulphite per ton of grapes at the crusher, to prevent fermentation during defecation. Allow the juice to defecate 24 to 48 hours and rack from the sediment.

"Add to each 100 gal. of juice 4 to 6 oz. of casein dissolved in sodium carbonate or ammonium hydroxid. Add a small amount of tartaric acid to increase the rate of separation of the cream of tartar. Heat the juice to 165° F. and store in 50 gal. barrels until most of the excess cream of tartar has separated. Rack from the sediment and filter, if necessary. Add a small amount of citric acid to prevent further separation of cream of tartar, and bottle. Pasteurize in bottle at 160°.

"Note that a temperature of 165° is recommended for the first cooking and 160° for the final heating. These are high enough temperatures to keep well-handled juice and will give a great deal less of the objectionable cooked flavor so evident in all grape juice now on the market."

See also a previous note (E. S. R., 30, p. 316).

Clarification of grape juice, F. T. BIOLETTI (*California Sta. Rpt. 1914*, pp. 190, 191).—These data are noted above.

Amounts of wine and of by-products yielded by grapes in a California winery, F. T. BIOLETTI (*California Sta. Rpt. 1914*, pp. 192, 193).—"In order to determine the degree of efficiency of our methods of wine making in utilizing the raw material as accurate an account as practicable was kept of the intake and output of a winery of moderate size." The results are given in tabular form.

Use of sulphurous acid and pure yeast in wine making, F. T. BIOLETTI (*California Sta. Rpt. 1914*, pp. 191, 192).—Modern methods of using pure yeast and sulphurous acid in the fermentation of wine were introduced into many wineries during the last vintage with excellent results. The wines produced were analyzed and compared with those made by the old methods in the same districts from the same varieties of grapes.

A very marked superiority as to the lowness of the volatile acid of the wines fermented with sulphurous acid was noted. The presence of a large number of injurious bacteria in most of the wines fermented without sulphurous acid was shown, not only by the high volatile acidity, but also by direct microscopic examination. The presence of a few bacteria in one-third of the wines fermented with both sulphurous acid and pure yeast probably indicate that owing to the greater clearness of these wines small numbers of bacteria were more easily observed.

"The benefits to be obtained from the use of pure yeast are more complete elimination of the sugar, as indicated in the table of analysis and higher quality of flavor and appearance, which were noticeable."

A new method of handling the distillation residues of wines, CAMILLE MATIGNON (*Chem. Ztg.*, 38 (1914), No. 36, pp. 386, 387).—A description of the Effront fermentation process for the utilization of wine distillation residues for the preparation of organic bases, cyanids, acids (acetic, butyric, etc.), and glycerin.

Bitter principles of olives, F. T. BIOLETTI (*California Sta. Rpt. 1914, pp. 197-199*).—In the preparation of either green or ripe olives for food one of the points taken into consideration is the removal of the bitterness. This is accomplished by prolonged soaking in water, by treatment with a caustic alkali (or lye) solution, or by a combination of both. As the exact nature of the substances to which the bitterness is due does not seem to be well understood, nor the effect on the principles by the various pickling operations, a series of tests was made for the purpose of throwing some light on these points.

The bitter principles are soluble in water, hot alcohol, and chloroform, and slightly soluble in ether. In crushing olives, some of the bitterness comes out with the juice and some remains in the pulp. The bitterness of olives is not discharged by exact neutralization, by the presence of a slight excess of alkali, by exact neutralization and heating under 15 lbs. pressure for one hour, by a slight excess of hydrochloric acid and heating under pressure, by heating untreated juice under pressure, the presence of an excess of sodium bicarbonate, or by fermentation with yeast. It is destroyed by using a considerable excess of either sodium hydroxid or sodium carbonate, or a slight excess of alkali and heating under pressure. The tests on juice alone indicated that a 2 per cent potassium hydroxid solution will destroy the bitterness immediately, and neutralization and the addition of a 0.7 per cent excess of potassium hydroxid within 24 hours. Adding an excess of 0.56 per cent of alkali had little effect. Owing to the resistance of the tissues of the olive to the passage of water the bitter principles are not so readily removed by water alone. The resistance may be diminished by soaking the olives in water containing caustic potash or soda, and these when used in excess will hydrolize oleuropéine, a glucosid which appears to be the cause of the bitterness.

Softening of olives, F. T. BIOLETTI (*California Sta. Rpt. 1914, pp. 199, 200*).—"Certain varieties of olives, and all when overripe, tend to become soft during the pickling processes, especially in the lye solutions. Salt may be used in conjunction with the lye to counteract this softening effect." Tests made to determine the proper amount of salt to use resulted in showing that 3 per cent appears to be suitable and sufficient even with strong lye solutions.

Sizing of pickled olives, F. T. BIOLETTI (*California Sta. Rpt. 1914, pp. 200, 201*).—Determinations of the sizes—i. e., average diameters and corresponding number of olives per pound—were made on a number of commercial samples of pickled olives. The variations in each size were found to differ very much with different brands of olives, the differences depending probably on the kind of sizing machine employed.

Tables giving the results of the measurements are presented.

Olive paste, F. T. BIOLETTI (*California Sta. Rpt. 1914, p. 200*).—Certain varieties of olives, and a certain proportion of even the largest varieties, are too small to satisfy the popular demand for a large pickled fruit. The small fruits are used for the manufacture of oil, but their value for this purpose is small, although when pickled they equal or exceed the large olives in flavor.

"More or less successful attempts were made to use these small olives and also overripe, frost-bitten, and bruised olives for the preparation of an olive paste, which could be used in the same way as the various meat pastes commonly found on the market. It was found possible to remove the pits of the fresh olives, grind up the pulp, remove the bitterness, salt to taste, and thus produce an olive paste that was relished by everyone to whom it was submitted and usually pronounced better than any meat paste and even better than the best ripe pickled olives. The processes tested were rapid, requiring from 48 to less than 5 hours. It is probable that a process could be devised which would be continuous.

"The main defects of this method of utilizing olives are the comparatively small amount of paste yielded by a given weight of olives. . . . With the methods used, a ton of small olives would yield on the average about 1,000 lbs. of olive paste. As the process of manufacture is simple and inexpensive, even this yield should be more profitable than oil-making if the public would be willing to pay as much for olive paste as for meat pastes."

A history of the canning industry, edited by A. I. JUDGE (*Nat. Canners' Assoc. Ann. Conv.*, 7 (1914), pp. 162, pls. 4, figs. 141).—Contained in this report are a series of articles relating to various phases of the canning industry, among which are the history of the canning of meat, milk, tomatoes, and corn, and the development of the canning industry in the different parts of the United States. The report also contains statistical data concerning the packs of corn, peas, and tomatoes, and the ripening and canning dates of certain vegetables and fruits.

METEOROLOGY.

Weather forecasting, S. F. SIMMS (*Rhodesia Agr. Jour.*, 11 (1913), No. 2, pp. 234-240, pl. 1; 11 (1914), No. 3, pp. 428-435).—This article discusses briefly the main principles of weather forecasting and explains how such forecasts can be made by an observant person with a few instruments at his disposal.

Monthly Weather Review (*Mo. Weather Rev.*, 42 (1914), Nos. 7, pp. 409-472, pls. 11, figs. 43; 8, pp. 473-518, pls. 13, figs. 15).—In addition to notes on weather forecasts for July and August, 1914, river and flood observations, lists of additions to the Weather Bureau library and of recent papers on meteorology, the weather of the month, a condensed climatological summary, and climatological tables and charts, these numbers contain the following articles:

No. 7.—Free-Air Data in Southern California, July and August, 1913, by W. R. Blair and W. R. Gregg; The Horizontal Rainbow, by S. Fujiwhara; Observations of Horizontal Rainbows, by K. Nakamura; The Halos of November 1 and 2, 1913, by L. Besson; The Different Forms of Halos and Their Observation, by L. Besson; Halos and Their Relation to the Weather, by A. H. Palmer; The Microbic Content of Indoor and Outdoor Air, by C. E. A. Winslow and W. W. Browne (see p. 211); Theoretical Meteorology: More Particularly the Thermodynamics of the Atmosphere, by W. von Bezold; and Ice Storms of New England.

No. 8.—The Total Radiation Received on a Horizontal Surface from the Sun and Sky at Mount Weather, Va. (illus.), by H. H. Kimball; The Absorption of the Atmosphere for Ultraviolet Light, by T. Lyman; The Exudation of Ice from Stems of Plants (illus.), by W. W. Coblentz (see p. 221); Are Lightning Flashes Unidirectional or Oscillating Electric Discharges? (illus.), by C. F. Marvin; The Atmosphere of the Planet Mars, by W. H. Pickering; Does the

Darkest Hour Come Just Before Dawn? and Notes on Balloon Observations and on Waterspouts from the Voyage of La Pérouse.

The weather and climate of Chicago, H. J. COX and J. H. ARMINGTON. (*Geogr. Soc. Chicago Bul.* 4 (1914), pp. XXV+375, pls. 3, figs. 110).—The characteristic features of the climate and weather of Chicago are dealt with in detail. In the main divisions of the work the order adopted is that of annual, seasonal, and monthly values followed by a discussion of daily conditions. Temperature, precipitation, atmospheric moisture, cloudiness and sunshine, wind direction and velocity, and barometric pressure are discussed in turn. The data upon which these discussions are based are chiefly those of the official records of the Weather Bureau beginning with the establishment of the local weather office in October, 1870.

Report on meteorological observations at Wisley, 1913, R. H. CURTIS (*Jour. Roy. Hort. Soc. [London]*, 40 (1914), No. 1, pp. 50-64, figs. 4).—The meteorological conditions, mainly temperature and rainfall, of each month of the year are summarized and compared with conditions in other parts of the United Kingdom.

The rainy season in southern Rhodesia, E. GOETZ (*Rhodesia Agr. Jour.*, 11 (1914), No. 5, pp. 689-702).—The characteristic conditions preceding and accompanying the rainy season which begins in this region about the last of October and ends about the last of March are briefly discussed. The rains like most other weather changes proceed from the west to the east.

The microbic content of indoor and outdoor air, C. E. A. WINSLOW and W. W. BROWNE (*Mo. Weather Rev.*, 42 (1914), No. 7, pp. 452, 453).—Examinations of 353 samples of air from different sources indicate that "(1) the number of microbes developing at 20° C. from outdoor air in suburban districts is generally under 50 per cubic foot and rarely over 100. The count at 37° C. for such air is about half that at 20° C. and rarely over 50 per cubic foot. The number of mouth streptococci in such air is small—in the neighborhood of 10 per 100 cu. ft. The air from more remote regions would no doubt show still smaller numbers.

"(2) The air of city streets shows a slightly higher number of microbes, but the general relations are much the same in all the respects noted above.

"(3) The air of occupied spaces shows, as might be expected, larger average numbers of bacteria and much greater fluctuations. The 20°-count may average over 100 microbes per cubic foot, as in the factories studied, and may reach 700 or more as in some of the offices. The 37°-count averaged over 50 both in factories and offices and was nearly as high as the 20°-count in the latter case. A few very high 37°-counts were obtained, two between 1,000 and 2,000 in offices, and one of 5,200 in the country, the latter clearly abnormal. Mouth streptococci are much more abundant in indoor air, ranging from 20 to 40 per 100 cu. ft. of air, and the results bear out the conclusion that the number of these organisms furnishes a good measure of mouth pollution due to concentration of population in confined spaces."

SOILS—FERTILIZERS.

The fertility in Iowa soils, P. E. BROWN (*Iowa Sta. Bul.* 150 (1914), pp. 89-152, fig. 1).—This bulletin discusses the soils of Iowa with reference to plant food content, progressive removal of plant food by crops, and methods and requirements for the maintenance of fertility, and reports chemical analyses of

366 samples of soils taken at three different depths in 122 different localities in the State, the average results of which are given in the following table:

Plant food in Iowa soils.

Soil area.	Number of samples analyzed.	Total calcium.	Total inorganic carbon.	Total organic carbon.	Total nitrogen.	Total phosphorus.	Total potassium.
<i>In pounds per 2,000,000 pounds of surface soil (0-6½ inches).</i>							
Missouri loess.....	40	<i>Pounds.</i> 12,059	<i>Pounds.</i> 117	<i>Pounds.</i> 48,895	<i>Pounds.</i> 4,017	<i>Pounds.</i> 1,538	<i>Pounds.</i> 33,875
Mississippi loess.....	26	10,912	90	51,320	4,110	1,361	31,100
Southern Iowa loess.....	26	10,522	74	55,424	4,464	1,368	32,584
Wisconsin drift.....	21	18,975	135	69,730	5,458	1,395	28,742
Iowan drift.....	21	8,968	97	57,211	4,526	1,289	22,247
<i>In pounds per 4,000,000 pounds of subsurface soil (6½-20 in.).</i>							
Missouri loess.....	40	22,838	162	67,934	5,265	2,697	67,382
Mississippi loess.....	26	19,766	132	65,061	5,232	2,204	64,069
Southern Iowa loess.....	26	20,418	107	71,976	5,596	2,089	65,984
Wisconsin drift.....	8	29,401	382	98,765	8,011	2,217	55,800
Iowan drift.....	21	18,199	168	74,169	5,716	2,207	48,019
<i>In pounds per 6,000,000 pounds of subsoil (20-40 in.).</i>							
Missouri loess.....	40	34,805	288	55,041	4,116	3,892	96,372
Mississippi loess.....	26	32,620	138	49,140	4,037	3,003	91,980
Southern Iowa loess.....	26	35,576	118	48,876	3,909	2,972	93,119
Wisconsin drift.....	8	257,954	48,727	54,825	4,255	3,253	77,500
Iowan drift.....	20	24,795	258	42,637	3,372	2,889	72,380

From these analyses it is concluded that "there is not an inexhaustible supply of either phosphorus or potassium in the soils of the State," although "if the content of the soil in these constituents to a depth of 40 in. is considered the 'life' of the soil may be considerably lengthened." Maintenance of the supply of potash requires less emphasis at this time than the keeping up of the supply of phosphorus. It is pointed out that in many cases it is just as essential, if not more so, with many of the soils to maintain suitable moisture and air conditions by proper cultivation, and to keep the soil "sweet" by means of ground limestone and well stocked with organic matter by means of green manure and barnyard manure as it is to keep up the plant food supply by means of fertilizers.

Analyses of gumbo and peat soils are also reported. The infertility of gumbo soils is said to be due to their physical condition rather than to a lack of plant-food constituents. Physical methods of treatment of such soils are urged with possibly the application of phosphoric acid to insure their continued fertility. The addition of plant-food constituents is said to be also unnecessary for peat soils at present, but proper physical treatment is particularly needed, together with a system of cropping.

An investigation of the carbon-nitrogen ratio of the various soil types of the State showed that, not only in the surface soils but also in the subsurface and subsoils, in no case was the ratio narrow enough to show the lack of easily decomposable matter.

Soil acidity and the liming of Iowa soils. P. E. BROWN, F. B. HOWE, and M. E. SAR (*Iowa Sta. Bul. 151 (1914), pp. 156-200, fig. 1*).—This bulletin discusses causes and effects of soil acidity, reports comparative tests of methods of detecting soil acidity, and gives the results of examinations for soil acidity of the various classes of Iowa soils. A study of the sources, kinds, and methods of application of lime compounds best suited to correct acidity in these soils is also reported.

"The results of tests of many samples from the five large soil areas in Iowa show that soils in the Mississippi loess, the southern Iowa loess, and the Iowan drift areas are very apt to be acid while those in the Wisconsin drift are only occasionally in need of lime and those in the Missouri loess are very rarely in an acid condition.

"The average amounts of limestone needed by acid soils in the large areas have been calculated and average recommendations have been made. When soils within the Missouri loess and Wisconsin drift areas show acidity an application of $3\frac{1}{2}$ to 4 tons of limestone per acre may be regarded as the proper amount to use in most cases. Three and one-half to $4\frac{1}{2}$ tons of limestone per acre is the average recommendation for the Mississippi loess, $3\frac{1}{2}$ to 5 tons per acre for the southern Iowa loess, and 4 to $5\frac{1}{2}$ tons per acre for the Iowan drift.

"Acid soils in these three latter areas are usually underlaid by acid sub-surface soils and subsoils, and as the limestone requirement is determined only for the surface soil future tests of the soils will be necessary to insure the maintenance of a basic reaction, even after the application now recommended is made.

"After acidity in the soil has once been entirely neutralized the use of 1 to 2 tons of limestone per acre once in four or five years should prove ample to keep the soil from becoming acid."

The comparative tests of methods for detecting soil acidity indicated that the Veitch and litmus paper methods are very satisfactory when made by experienced persons. The litmus paper test is especially recommended for field use.

Ground limestone or limestone screenings are considered the cheapest and best form of lime to use on Iowa soils, being fully as satisfactory as hydrated or caustic lime and not subject to the objection of causing injurious effects in the soil. The limestone can be more cheaply secured in the State than the other forms.

The utilization of muck lands, C. S. ROBINSON (*Michigan Sta. Bul.* 273 (1914), pp. 3-29, figs. 8).—This is a general discussion of types, agricultural uses, crop adaptations, and fertilizer requirements of muck lands, based in part upon work done by the Michigan Station and in part upon other investigations.

Swamp lands are said to constitute one-seventh of the total area of the State, a large portion of which could be developed in a practical way for the permanent production of crops by draining and fertilization. "Potash and phosphoric acid are the mineral fertilizing elements which give the best returns, while barnyard manure also causes a large crop increase in most cases. Except on distinctly acid deposits, lime does not as a rule give good results.

"[Muck] deposits which are not suited to the direct production of crops may be used to reinforce manure either in composting or as a stable litter. In this way the manurial value of the muck is increased while the valuable ingredients of the mixture may be materially enhanced by the addition of phosphatic material."

Soil survey of Ralls County, Missouri, A. T. SWEET and W. I. WATKINS (*U. S. Dept. Agr., Advance Sheets Field Operations Bur. Soils*, 1913, pp. 41, fig. 1, map 1).—This survey, made in cooperation with the University of Missouri, was issued November 24, 1914. It deals with an area of 307,840 acres in northeastern Missouri which comprises three distinct topographic divisions, the level or gently rolling uplands, the hilly regions, and the bottom lands or stream flood plains.

The county is drained almost entirely by the Salt River and its tributaries. Many areas in the county are in need of drainage. The soils of the county are grouped according to origin into residual, glacial, loessial, and alluvial soils. Eleven types are mapped, of which the Putnam silt and Shelby loams are the most extensive. "There is a general need in Ralls County for the more extensive growing of clover and cowpeas, the more careful and liberal use of manure and of green fertilizers, the application of lime, deeper plowing followed by more persistent surface cultivation, to collect and hold moisture, and the intelligent use of commercial fertilizers."

Soil survey of Cass County, Nebraska, A. H. MEYER, R. J. SCARBOROUGH, ET AL. (*U. S. Dept. Agr., Advance Sheets Field Operations Bur. Soils, 1913, pp. 46, fig. 1, map 1*).—This survey, made in cooperation with the University of Nebraska, was issued October 12, 1914. It deals with the soil types and crop adaptabilities of an area of 353,280 acres located in the extreme eastern part of Nebraska and comprising three general topographic divisions, viz, uplands, terraces, and river bottoms. In texture the majority of the upland and terrace soils are silty, while those of the bottom lands vary from a loose, incoherent sand to a heavy clay. Seventeen soil types are mapped, of which the Marshall silt loam is the most extensive and the most important for grain farming. Every part of the county is said to be, in general, well drained. Grain farming is the chief type of agriculture practiced.

Soil survey of Forsyth County, North Carolina, R. T. ALLEN and R. C. JURNAY (*U. S. Dept. Agr., Advance Sheets Field Operations Bur. Soils, 1913, pp. 28, fig. 1, map 1*).—This survey, made in cooperation with the North Carolina Department of Agriculture, was issued October 31, 1914. It deals with an area of 253,440 acres in northwestern North Carolina, which topographically is a high plateau dissected by numerous streams and having a generally rolling and uneven surface. Drainage is said to be well established, the greater part of the area being drained by the Yadkin River and its tributaries. The soils of the county are of residual and alluvial origin. Six types are mapped, of which the Cecil series is the most important and extensive, covering more than 80 per cent of the county. "Most of the soils of Forsyth County are capable of being built up and maintained in a high state of productiveness."

Soil survey of Union County, South Carolina, C. LOUNSBURY ET AL. (*U. S. Dept. Agr., Advance Sheets Field Operations Bur. Soils, 1913, pp. 36, fig. 1, map 1*).—This survey, issued November 9, 1914, deals with an area of 327,680 acres in the northwestern part of South Carolina. The general topography of the county is that of a moderately sloping plain thoroughly dissected by stream erosion. "Topographically most of the land is suitable for agricultural operations, but there are many slopes sufficiently steep to cause the soils to erode badly under cultivation, unless terraced or left in timber or grass." The drainage is to the southeast, eventually entering the Broad River. The soils of the county are separated into 15 different types, 12 of which occupy the residual uplands and 3 the alluvial bottom lands. The Cecil sandy and Cecil clay loams are the most extensive types. "Average crop yields are low, owing to poor practice rather than poor soils. . . . Commercial fertilizers are depended upon for crop production, and little attention is given to the increase or maintenance of the organic supply of the soils."

Soil survey of Henrico County, Virginia, W. J. LATIMER and M. W. BECK (*U. S. Dept. Agr., Advance Sheets Field Operations Bur. Soils, 1913, pp. 38, fig. 1, map 1*).—This survey, issued October 15, 1914, deals with an area of 168,960 acres near the center of Virginia, the topography of which varies from gently rolling or hilly to gently undulating or level. The county embraces a large variety of soils, ranging from well-drained uplands and poorly-drained

flat uplands to productive bottom lands. The upland soils are broadly divided into Piedmont and Coastal Plain soils and the alluvial soils into overflowed stream bottoms and bench lands which are not subject to overflow. Twenty-seven soil types, varying from a silty clay loam to a gravelly sandy loam are mapped. "There are no two [types] which have exactly the same crop adaptation, crop value, or fertilizer, lime, drainage, or tillage requirement." It is stated that nearly all of the land in the county can be farmed and is, or has been, under cultivation.

"The majority of the soils are very productive, some of them representing the strongest soil types of the Southeastern States. The lighter soils respond very readily to good treatment and are excellent for early truck crops. The 'slash lands' represent the poorest soil in the county. These need thorough drainage before they can be most profitably cropped."

Systematic study of the soils of the Netherlands in the interest of agriculture, J. G. MASCHHAUPT (*Cultura*, 26 (1914), No. 311, pp. 235-240).—The author suggests the reorganization of the soil studies at the agricultural experiment stations in the Netherlands on a more systematic basis, taking account of the various geological, physical, chemical, and agronomic factors.

The scouring lands of Somerset and Warwickshire, C. T. GIMINGHAM (*Jour. Agr. Sci. [England]*, 6 (1914), No. 3, pp. 328-336).—Further studies of the so-called "teart" lands (E. S. R., 28, p. 216) which cause scouring in cattle at certain times of the year led to the conclusion "that scouring is due to the physiological action of some constituent or constituents of the herbage which are not normally present but only occur under special soil (and weather) conditions; and further that the soil conditions are determined by the texture and can be removed when the texture is appropriately changed."

Soil culture primer, H. W. CAMPBELL, revised and edited by R. A. HASTE (*Lincoln, Nebr.*, 1914, 4. ed., rev., pp. 108, figs. 24).—This is the fourth revised edition of this manual dealing especially with the author's method of soil culture for semiarid regions. It presents in a brief elementary way what is treated in detail in the author's larger manual on the subject (E. S. R., 19, p. 428).

A nitrogenous soil constituent: Tetracarbonimid, E. C. SHOREY and E. H. WALTERS (*U. S. Dept. Agr., Jour. Agr. Research*, 3 (1914), No. 2, pp. 175-178).—The isolation from soils and identification of tetracarbonimid ($C_4H_4N_4O_4$) are described. The substance was isolated from a number of different kinds of soils from various localities indicating that it "is not an uncommon or accidental soil constituent."

In one case as much as 30 mg. of the substance was obtained from 18 kg. of soils notwithstanding a loss in purification of at least 50 per cent. It is estimated that an acre-foot of the soil contained approximately 7 lbs. of tetracarbonimid representing 2.3 lbs. of soil nitrogen. "This soil had a total nitrogen content of 0.13 per cent, or approximately 5,200 lbs. of nitrogen per acre-foot, and it appears that the quantity of tetracarbonimid nitrogen is at any one time but a very small part of the total." However, some evidence was obtained in the investigation "indicating that the quantity of tetracarbonimid fluctuates under varying conditions of cultivation or crop growth," and may under certain conditions represent "an important step in the transformations that organic nitrogen undergoes in the soil."

Recent investigations of soil concretions due to manganese or lime, M. HELBIG (*Naturw. Ztschr. Forst u. Landw.*, 12 (1914), No. 8, pp. 385-392).—Nut-shaped inorganic concretions of about 3 cm. diameter were found at about 22 cm. depth in soil overlying a bed of diluvial sand. These contained on the average 26.8 per cent manganese dioxid, 23.5 per cent ferric oxid, and 10.5 per

cent aluminum oxid, and constituted about 44.24 per cent of the total soil. The conditions of their occurrence are said to indicate that they are of recent local origin, and although several theories are advanced no satisfactory explanation of the manner of their origin is given. Similar concretions were found in a sandpit in a diluvial loess loam underlain by a strongly kaolinized leached out porphyry, which in turn rests on diluvial sand. It is thought that these originate from the precipitation in place of manganese, and iron in solution coming from below.

The origin of a limestone concretion found in the Rhine Valley is attributed to the precipitation of leachings from adjacent limestone cliffs.

The necessity for determining the water content of soil on the basis of the soil volume, R. REGEL (*Trudy Bûro Prikl. Bot. (Bul. Angew. Bot.)*, 7 (1914), No. 4, pp. 257-262).—Soil moisture determinations at different depths and at different parts of each of several experimental plats showed no correspondence between the quantity of soil moisture and crop development, owing mainly it is thought to the varying specific weights of the soil. It is concluded that to correlate more accurately soil moisture content and crop development the determination of soil moisture contributing to crop development should be based not on the weight but on a fixed volume of soil.

A study of the bacterial activities of virgin and cultivated soils, J. E. GREAVES (*Centbl. Bakt. [etc.]*, 2. Abt., 41 (1914), No. 11-17, pp. 444-459).—A study of the bacterial activities of virgin and cultivated soils from nine farms in Utah, situated at various places within a radius of 45 miles, is reported.

The soils varied in physical composition from a heavy clay to a fine sand, and were well stocked with calcium carbonate and plant food elements with the exception of nitrogen. The number of organisms, the amount of nitric nitrogen, and the nitrogen fixation were found to be twice as great in cultivated soils as in virgin soils. Wheat soils contained greater numbers of organisms and more nitric nitrogen than alfalfa soils, but nitrogen fixation was slightly greater in the latter. Nitrogen fixation was greater in soils comparatively rich in combined nitrogen than in those poor in organic nitrogen. Cultivation of the soil increased bacterial activity and available plant food.

It is thought likely "that a part of the increase in crops which results from summer fallowing, disking, and the like is due to increased available plant food of the soil brought about by increased bacterial activities. The various microscopic nitrogen fixing organisms of the soil play an as yet unmeasured, but appreciable part in the maintenance of the nitrogen content of the cultivated arid soils. The abundance of *Azotobacter* present in the soil and the ideal condition prevailing for their activity make it appear that it is this species that play the greatest part in fixing the nitrogen."

Bacteriological studies of field soils.—III, The effects of barnyard manure, P. E. BROWN (*Iowa Sta. Research Bul.* 13 (1914), pp. 421-448).—The work here reported has been previously noted from another source (E. S. R., 31, p. 121).

To what extent can the results of fertilizer and variety tests be influenced and thus lead to false conclusions? B. ROGALSKI (*Illus. Landw. Ztg.*, 34 (1914), Nos. 43, pp. 400, 401; 44, pp. 407, 408).—The various factors which must be taken into consideration in planning and in drawing deductions from the results of such experiments are discussed.

Results of fertilizer experiments carried on in the years 1911-1913 at Lauchstädt and Gross-Lübbers, SCHNEIDEWIND and D. MEYER (*Mitt. Deut. Landw. Gesell.*, 29 (1914), No. 28, pp. 406-409).—Tests of various green manuring plants (*serradella*, yellow and white clovers, peas, beans, and lupines) on

sugar beets and potatoes are reported. The direct and after effects of the manures are discussed.

Experiments with fertilizers in Java, A. W. K. DE JONG (*Dept. Landb., Nijv. en Handel [Dutch East Indies], Meded. Agr. Chem. Lab., No. 6 (1914), pp. 1-65*).—Experiments with fertilizers, particularly superphosphate, on different Java soils are reported. The crop most largely experimented with was rice, but experiments were made with other crops including sugar beets, sweet potatoes, corn, and tobacco. The most pronounced result obtained was the evidence of a general need of phosphoric acid in the soils.

The fertilizing of fish ponds, W. HAMER (*Mitt. Land. Fisch. Ver. Herzog. Oldenburg, 4 (1914), No. 2; abs. in Zentbl. Agr. Chem., 43 (1914), No. 8, p. 571*).—Comparative tests on a number of fish ponds of various fertilizer mixtures used to increase the aquatic growths which the fish can consume and thus reduce the amount of food which must be supplied them are reported. It was found that the most profitable returns in fish produced were from the use of a mixture of potash and Thomas slag.

The nitrogen of processed fertilizers, E. C. LATHROP (*U. S. Dept. Agr. Bul. 158 (1914), pp. 24*).—An account is given in this bulletin of studies of the nitrogenous compounds occurring in a fertilizer made by the treatment of various trade wastes and refuse such as hair, garbage tankage, leather scraps, etc., with rock phosphate and the requisite amount of sulphuric acid.

It was found that the hydrolysis of the protein was almost complete, the nitrogenous compounds in the finished fertilizer being principally the products of primary protein decomposition, together with a small amount of a proteose-like compound. Among the nitrogenous compounds isolated were guanin, hypoxanthin, arginin, histidin, lysin, leucin, and tyrosin, as well as a proteose-like compound which was found to be composed of acid amid radicals, diamino acid radicals, especially lysin, and monoamino acid radicals, particularly the monoamino acids which contain nonamino nitrogen.

"From a consideration of the amount and the physiological action on plants of the different forms of nitrogen present in the fertilizer it is concluded that the water soluble nitrogen of this fertilizer should have an availability equal to or greater than the nitrogen of dried blood, or other high-grade fertilizers. These results are in accord with the results obtained by the plant method of determining availability."

The general principle underlying this method of rendering available the nitrogen in trade waste is, therefore, shown to be either partial or complete hydrolysis of the protein, resulting in products which are not only directly utilized as nutrients by plants, but are more easily ammonified in the soil than the more complex compounds such as peptones, proteoses, and the proteins themselves.

On the presence of nitrites in calcium cyanamid, C. MANUELLI (*Ann. Chim. Appl. [Rome], 1 (1914), No. 3-4, pp. 110-114*).—Calcium cyanamid was found to contain a maximum of 0.56 per cent calcium nitrite.

The synthetic use of metals in organic chemistry, A. J. HALE (*Philadelphia, 1914, pp. XI+169*).—This book contains a section explaining fully the reactions involved in the fixation of free nitrogen resulting in the formation of calcium cyanamid which is of special interest from the standpoint of agricultural science.

Phosphate deposits in the Mississippian rocks of northern Utah, W. PETERSON (*Science, n. ser., 40 (1914), No. 1038, pp. 755, 756*).—Examinations of phosphate exposed in a cliff of very compact bluish gray limestone outcropping along the sides of the Logan River Canyon in Utah are reported. The zone of

which this is an outcrop is said to be more than 100 ft. thick and "consists of layers of phosphate and black and brown shale with interstratified layers of sandy limestone. In extent it is known to outcrop in a north-south direction for more than 40 miles, and sections studied show it to have an area of more than 100 square miles. It has been reported as far south as Ogden Canyon, but no detailed section has been measured in that locality."

Samples containing as high as 68.59 per cent of tricalcium phosphate were obtained from this outcrop.

The production and fertilizer value of citric-soluble phosphoric acid and potash, W. H. WAGGAMAN (*U. S. Dept. Agr. Bul. 143 (1914), pp. 12*).—Previous investigations bearing on this subject are reviewed and a method devised by the author for obtaining both potash and phosphoric acid in forms soluble in citric acid is described. This consists in mixing phosphate rock and feldspar, adding small quantities of iron and manganese oxides to promote fluidity or lower the melting point of the slag and heating the mixture to about 1,400° C. for about 20 minutes. This was found to give a product soluble not only in 2 per cent citric acid, but also fairly soluble in water saturated with carbon dioxide.

"Pot tests with typical soils showed that the [material] increased the growth of wheat plants, but the beneficial effect derived from such applications was not, on the whole, as marked as it was when more soluble forms of phosphate and potash were used. The indications are, however, that the slag product has a distinct high fertilizer value."

Progress in the potash industry in 1913, H. HOR (*Chem. Ztg., 38 (1914), No. 104-105, pp. 1045-1047*).—This is a brief review of literature appearing during the year bearing upon the geology, mineralogy, and general chemistry of potash deposits, and the technical chemistry, manufacturing methods and appliances, and agricultural use of potash products.

Ashes of hedge clippings and trimmings as a source of potash, E. J. RUSSELL (*Jour. Bd. Agr. [London], 21 (1914), No. 8, pp. 694-697*).—It is shown in this article that under favorable conditions hedge clippings and cleanings will yield at the rate of about 20 lbs. of ash containing about 10 per cent of potash for each 100 yards of hedge annually. It is also shown that the screenings and other waste from threshing grain will give about 52 lbs. per acre of ash containing 11.2 per cent of potash.

Potassium salts and agriculture (*Nature [London], 94 (1914), No. 2350, p. 287*).—This is a brief note on the possible sources of potash for the British farm aside from the German potash salts. The sources referred to include kelp and hedge clippings (see above). The author expresses the opinion that "taking all circumstances into consideration, . . . it does not appear that British agriculture will suffer for two or three years from potash starvation."

On the so-called potash lime, a by-product of potash works, P. EHRENBURG and O. NOLTE (*Jour. Landw., 62 (1914), No. 3, pp. 235-284*).—The material used in the experiments reported in this article contained 0.45 per cent of potash, 42.1 of lime, and 5.3 of magnesia. Its fertilizing value, both as a source of potash and of lime, was tested in comparison with lime ash in a series of pot experiments with various crops on sandy and loam soil. The results of these experiments showed a very low fertilizing value for the material.

Outline of the relation of the use of lime to the improvement of the soil, E. O. FIPPIN (*New York Cornell Sta. Circ. 25 (1914), pp. 41-49*).—This is a brief popular discussion of the subject.

Recent investigations on magnesia, E. MIEGE and COMPAIN (*Vie Agr. et Rurale, 3 (1914), No. 19, pp. 532, 533*).—Recent investigations on the lime-magnesia ratio are briefly reviewed.

The utilization of fish and marine animals as sources of oil and manure (*Bul. Imp. Inst. [So. Kensington]*, 12 (1914), No. 3, pp. 429-442).—This article describes briefly methods of manufacture of fish manure, cost of fish-reduction plants, kinds and composition of different fish used, and the quality and fertilizing value of fish scrap of different kinds.

Fish meal and fish manure (*Jour. Bd. Agr. [London]*, 21 (1914), No. 8, pp. 688-694).—This is a brief summary of information on this subject. Analyses and methods of use of fish feeds and manure are given.

Transformation of vinasse into fertilizer, L. ROOS (*Prog. Agr. et Vit. (Ed. l'Est-Centre)*, 35 (1914), No. 44, pp. 441, 442).—Brief directions are given for mixing this material with other fertilizing substances to produce a balanced fertilizer.

Road sweepings as manure (*Jour. Bd. Agr. [London]*, 21 (1914), No. 8, p. 733).—An analysis is reported which shows road sweepings to be "little if at all richer than ordinary soil, as far as manurial value is concerned." The samples examined contained 0.5 per cent of lime, 0.2 per cent of phosphoric acid, and 0.086 per cent of nitrogen. The potash is not reported.

Fertilizers, R. E. ROSE and F. T. WILSON (*Fla. Quart. Bul. Agr. Dept.*, 24 (1914), No. 4, pp. 89-114, 126-135, 140-164).—An account is given of the fertilizer inspection during 1914, including analyses of fertilizers examined, with notes on laws and regulations and valuation of fertilizers. There are also special articles on home mixing and on commercial fertilizers from the manufacturer's viewpoint (by Mrs. N. M. G. Prange).

Analyses of commercial fertilizers, H. E. CURTIS (*Kentucky Sta. Bul.* 177 (1913), pp. 413-591).—Analyses and valuations of 735 brands of commercial fertilizers examined during 1913 are reported.

Analyses of commercial fertilizers, H. M. STACKHOUSE, R. N. BRACKETT, ET AL. (*South Carolina Sta. Bul.* 177 (1914), pp. 93).—This bulletin reports and discusses analyses and valuations of 2,539 samples of commercial fertilizers examined during the season of 1913-14.

The quality of the fertilizers offered for sale in South Carolina during the season is compared with that of fertilizers examined in previous years. It is shown that 21.85 per cent of the fertilizers examined during 1913-14 were deficient in one or more ingredients as compared with 20.6 per cent during the previous year.

A table is given showing results of determinations of the nitrogen availability of various nitrogenous materials as shown by the Street method. The results show an average availability of at least 85 per cent of the total organic nitrogen and indicate raw materials of good quality.

Commercial fertilizers in 1913-14, G. S. FRAPS (*Texas Sta. Bul.* 168, pp. 3-34).—Analyses and valuations of fertilizers inspected during the season of 1913-14 are reported, with collateral information regarding fertilizers and fertilizer inspection, and a list of registered brands is given. The consumption of fertilizers in the State during the period covered by the inspection is estimated to have been 77,400 tons.

The South and the fertilizer industry (*Manfrs. Rec.*, 65 (1914), No. 24, pp. 47, 48).—Statistics of the production and consumption of fertilizers in the Southern States as compared with the whole United States are presented and discussed.

AGRICULTURAL BOTANY.

A botanical lexicon, P. G. GENNADIUS (*Lexikon Phytologikon. Athens*, 1914, pp. 16+1148).—This lexicon gives the names, habitat, and characteristics of more than 10,000 species of useful and ornamental plants with accounts of their

histories, uses, culture, diseases, etc. Appendixes are given which include the scientific names, English and French common names, synonyms, etc.

Contributions on plant breeding (*Beitr. Pflanzenzucht*, No. 4 (1914), pp. VIII+162, figs. 24).—This report, issued by the Society for the Advancement of Plant Breeding in Germany, gives an account of the fourth meeting at Bonn, June 1-3, 1913, with the addresses delivered on the subjects listed below, and discussions by numerous members: *New Aims in Plant Breeding*, by T. Remy; *The Production of Species Through Crossing and the Cause of Variability*, by J. P. Lotsy; *Modifications of Grape Stocks Through Breeding*, by Dern; *Sexual Propagation in Plants and its Significance in Heredity*, by M. Koernicke; *Ten Years of Practical Plant Breeding in Baltersbach* (Winter Wheat, Maize, Peas, etc.), by Pflug; *Plant Breeding as a Developmental Factor in Colonial Agriculture*, by T. Roemer; *The Problems and Practices in the Production of Tobacco Seed*, by H. Lange; *Application of Results of Recent Investigations to Plant Breeding in Agricultural Practice*, by Dix; and *Beet Raising for Feeding Purposes*, by Tritschler.

Hereditary variations in chlorophyll content of cereals, H. NILSSON-EHLE (*Ztschr. Induktive Abstam. u. Vererbungslehre*, 9 (1913), No. 4, pp. 289-300, pl. 1).—Selective breeding experiments with several domestic cereals exhibiting occasionally plants lacking chlorophyll or having other colors are said to have led to the general conclusion that such variations in chlorophyll content are recessive in relation to the normal or green color. It is pointed out that this finding agrees with that of Emerson (*E. S. R.*, 28, p. 231) for maize.

Tobacco investigations, W. A. SETCHELL (*California Sta. Rpt.* 1914, pp. 152-156).—An outline is given of investigations in tobacco breeding which are carried on under the author's direction.

These different investigations include attempts to analyze the various factors entering into the general inheritance, particularly to that of the flower, the behavior of sterile and partially sterile hybrids, the fixation of hybrids, experiments with the common peasant tobacco of Europe and the behavior of hybrids between the different varieties, hybrids between certain species of tobacco growing wild in California or cultivated by the Indians of that region, and observation of the parents of the various hybrids, together with a general study of species of *Nicotiana* for future experimentation.

Variation in bacteria, E. O. JORDAN (*Abs. in Science*, n. ser., 40 (1914), No. 1039, p. 776).—The author has attempted to distinguish in specific cases between true mutations and the more or less permanent adaptive modifications in bacteria that are due to environmental conditions, and to determine the relative value of each in the formation of so-called bacterial species and varieties. The effect of the acclimatization upon bacteria is considered as part of the problem.

The flower pigments of *Antirrhinum majus*.—III, The red and magenta pigments, MURIEL WHELDAL and H. L. BASSETT (*Biochem. Jour.*, 8 (1914), No. 2, pp. 204-208).—In continuation of work noted on page 202, the authors state that there are only two kinds of anthocyanin in *Antirrhinum*, red and magenta. Admixture with ivory pigment (apigenin) leaves these colors unaffected, but admixture with yellow pigment (luteolin) gives two other colors, bronze and crimson, respectively. Both red and magenta anthocyanin occur in varying amounts, giving rise to tinged, pale, and deep varieties, and both contain more oxygen than do the flavones, the percentage in the magenta being the higher. It is thought that if anthocyanins are derived from flavones the process is in part one of oxidation, as the anthocyanin molecules are thought to be larger than is the flavone molecule. If a flavone constitutes the chromogen, condensation

must take place, either of two flavone molecules or of a flavone with one or more molecules of an aromatic acid or phenol.

This work, discontinued for lack of pure material, is expected to be carried forward later and to throw light upon the constitution of anthocyanins.

Distribution of stomata in some graminaceous seedlings, E. ZAEFFEL (*Compt. Rend. Acad. Sci. [Paris]*, 159 (1914), No. 2, pp. 205-207; *abs. in Pharm. Jour. [London]*, 4. ser., 39 (1914), No. 2652, p. 251; *Gard. Chron.*, 3. ser., 56 (1914), No. 1446, p. 192).—Studies herein described regarding the location of stomata on growing seedlings of wheat, oats, *Panicum altissimum*, and *Paspalum stoloniferum* in connection with localization of heliotropic response of the different parts apparently tend to indicate that the region of the cotyledon in which the stomata are most abundant is that of greatest heliotropic sensitivity.

The transpiration current in plants, II, J. M. JANSE (*Jahrb. Wiss. Bot. [Pringsheim]*, 52 (1913), No. 5, pp. 509-602, figs. 12; *abs. in Bot. Centbl.*, 123 (1913), No. 22, pp. 565, 566).—In continuance of a previous contribution (E. S. R., 20, p. 324) dealing chiefly with water movements concerned in transpiration, the author here discusses the apparent agency of the roots in this connection, including the activity of endodermal cells as studied in vascular plants, views of some other authors being given. The protoplast alone is credited with work so done, the exact character of its action remaining unknown.

The activities of the protoplasts in the cells concerned with water transport, J. M. JANSE (*Jahrb. Wiss. Bot. [Pringsheim]*, 52 (1913), No. 5, pp. 603-621, figs. 2).—Discussing data and conclusions above mentioned, the author suggests the possible efficacy, in this connection, of a hydrolytic ferment in the cell protoplasm; of ready reversibility in reactions (hydrolytic processes in some cases requiring but little energy for their accomplishment or reversal); of circulation in cell contents, bringing any given portion alternately to opposite sides of the cell; of synchronism between reversal of reaction and circulation period; and of the above ferment as controlling the direction and extent of the reaction even in the presence of considerable opposing forces.

Osmotic pressure of some epiphytes and parasites, G. SENN (*Verhandl. Naturf. Gesell. Basel*, 24 (1913), pp. 179-183).—This is a study of the osmotic pressure of the cell sap of some parasites and epiphytes and of other plants from the same localities. The results, as tabulated, tend to show that parasites possess a higher osmotic pressure than their corresponding host plants, with the possible exception of certain succulent species of both classes.

The exudation of ice from stems of plants, W. W. COBLENTZ (*Mo. Weather Rev.*, 42 (1914), No. 8, pp. 490-499, pls. 5, figs. 7).—In this paper the author describes the formation of ice fringes upon the dittany (*Cunila mariana*). The data given are based upon experiments and observations in the field and laboratory, from which it appears that the ice formation is not a function of the surface condition of the stem. The ice was found to be formed on stems without roots, and consequently it can not be considered as a result of hydrostatic pressure exerted by the roots. The ice fringe was found to be a composite of a number of very thin ribbons, the composition of which is described. It is considered that moisture is brought to the surface by capillary action, and when the rate of supply to the surface is more rapid than the loss by evaporation, ice is formed if the air is at a sufficiently low temperature.

Method of determining the life duration of seeds, W. CROCKER and J. F. GROVES (*Abs. in Science*, n. ser., 40 (1914), No. 1039, pp. 775, 776).—The authors briefly outline various theories regarding the cause of the loss of vitality in seeds and give a preliminary account of investigations to test the hypothesis that the loss of vitality is due to a slow coagulation of cell proteins of the

embryo. This was tested by making a study of the life duration of seeds at two high temperatures, and using these values to express the relation between time and temperature for the coagulation of protein formation to determine the life duration at any desired temperature.

Plant autographs and their revelations, J. C. BOSE (*Nature* [London], 93 (1914), No. 2334, pp. 546-550, figs. 10; noted in *Agr. News* [Barbados], 13 (1914), No. 322, p. 279).—This is a condensed account of the author's recent investigations (*E. S. R.*, 30, p. 429).

Results of 12 methods employed are claimed to agree in showing that the nervous impulse in plants is fundamentally identical in character with that in animals. Its velocity of transmission in plants tested was less than in those of the higher, but greater than in those of the lower, animals, being affected by conditions in both cases.

The rate of plant growth and its variations under the action of food materials and different forms of stimulation can be recorded very quickly, it is claimed, by the crescograph, an instrument devised by the author, which offers a delicate means of testing the effects of foods, stimuli, etc., in agricultural experimentation.

A comparison of the responses of sessile and motile plants and animals, V. E. SHELFORD (*Amer. Nat.*, 48 (1914), No. 575, pp. 641-674).—On account of the increased attention the biologists are giving to responses to stimuli, the author presents an analysis of the kinds or aspects of response, the kinds of response that are comparable, and the bearing of response phenomena on biological theory and controversy.

The paper aims to show that the numerous kinds of response are reducible to a few simple types common to both plants and animals and that the failure to consider all types has been responsible for confusion and various one-sided theories.

A bibliography is appended.

Thermotropism of roots, SOPHIA ECKERSON (*Bot. Gaz.*, 58 (1914), No. 3, pp. 254-263, figs. 6).—An investigation of seedlings of *Raphanus sativus* and *Pisum sativum*, whose roots were exposed to unilateral warming, and a study of permeability of roots of these plants are said to show that thermotropic curvatures of roots and permeability of their cells to solutes both vary with species and with temperatures employed. It is also stated that the greater permeability is on the concave side of the root, changing with the thermotropic reaction, these two showing an exact parallel, and turgor change due to permeability accounting for the curvature. Heat also acts here not as a stimulus, but by affecting permeability as a direct factor producing curvature. The general conclusion is reached that thermotropism is not a tropism but a turgor movement.

On the nutritive conditions determining the growth of certain freshwater and soil protista, H. G. THORNTON and G. SMITH (*Proc. Roy. Soc. [London]*, Ser. B, 88 (1914), No. B 601, pp. 151-165, pl. 1, figs. 2).—This is a preliminary study of the determining causes of changes noted in the successive but usually irregular developmental phases of certain organisms.

A study of the cultures of soil flagellates is said to show that, as compared with *Euglena*, they are able to live in cultures to which organic compounds of varying natures have been added, this comparative impartiality being the result of the holozoic mode of nutrition, and the development of the flagellates being dependent on the bacterial growth. It is said also that the presence of Miquel salts in the solution is necessary for the growth of the soil flagellates and for the proper development of the different types of bacteria upon which they feed.

Photochemical studies on the assimilation of nitrites and nitrates, O. BAUDISCH and E. MAYER (*Hoppe-Seyler's Ztschr. Physiol. Chem.*, 89 (1914), No. 3, pp. 175-227; *abs. in Jour. Chem. Soc. [London]*, 106 (1914), No. 617, I, p. 365).—The authors claim to have shown that under suitable illumination both nitrates and nitrites give off oxygen, this result being due mainly to the ultraviolet rays. In solutions of potassium nitrite in alcohol or aldehyde the corresponding hydroxamic acids are produced. On prolonged illumination amino-compounds, and probably nitrogenous cyclo-compounds, are formed after the disappearance of the nitrite and the hydroxamic acid. This is said to be the first instance of the conversion of nitrites and nitrates into organic nitrogen compounds by the action of light. It is thought probable that in plants the same process may take place since here the factors nitrates, formaldehyde, and light are present.

An extensive bibliography is appended.

The influence of salt on plants, A. J. EWART (*Jour. Dept. Agr. Victoria*, 12 (1914), No. 7, pp. 420-423).—Experiments were carried out in 1912 and 1913 primarily to determine the after-effect of a salt dressing and how long the effect lasts. Figures are given for eight common crops.

A very heavy salt dressing retarded germination, the seeds in some cases rotting in the soil. The injurious action of salt where it appeared is said to have been due mainly to osmotic influence, the seedlings usually growing vigorously after heavy rains began.

The second year insufficient salt remained to injure the crops directly, and a decided increase occurred in most of the crops tested. The stimulating action of a moderate dressing of salt is said to be due partly to its solvent action on the mineral constituents of the soil, possibly in part because the absorbed salt acts as an oxidase sensitizer or catalytic agent in plant metabolism. The injurious effect of a dressing of 64 cwt. of salt per acre was still perceptible the second year after a rainfall of 35 in. with some crops noted, but a degree of benefit was apparent in about as many others. One plat treated with 64 cwt. of salt and giving a high yield of beets in the first year gave a light crop of rape the last year. It is thought that salt may increase the yield at the expense of food materials in the soil, which thereby tend to be exhausted by the increase of solubility of such constituents.

The measurement of antagonism, W. J. V. OSTERHOUT (*Bot. Gaz.*, 58 (1914), No. 3, pp. 272-276, figs. 3).—Methods are suggested for the graphical expression of antagonism in mixtures of three or more components in the nutritive medium.

FIELD CROPS.

The work of the Scottsbluff reclamation project experiment farm in 1913, F. KNORR (*U. S. Dept. Agr., Bur. Plant Indus., Work Scottsbluff Expt. Farm*, 1913, pp. 1-18, figs. 4).—In this paper the progress of the work with irrigated crops in 1913 at the Scottsbluff experiment farm near Mitchell, Nebr., is briefly discussed. The weather and crop conditions for the year are given.

The crops used in the rotation experiments include alfalfa, beets, corn, flax, oats, potatoes, and spring and winter wheats. These are arranged in 22 different rotations. It is noted that "in every case where the crops followed alfalfa the highest average yields were obtained, indicating very strongly that the alfalfa had a beneficial effect on the succeeding crops. Manure on oats stubble greatly increased the yields of beets and potatoes the following year. The yields of the crops following beets and potatoes were very good, almost as good as those obtained with crops following alfalfa or grown on manured oat

land. Crops following corn were rather poor. This was particularly noticeable in the case of oats. Perhaps the most striking effect of a previous crop on yield was in the case of oats following corn, beets, and potatoes, respectively. These plats were not plowed, but were disked in the spring, seeded the same day, and received the same treatment throughout the remainder of the season as the other oat plats, but the yield of oats following corn was 36.2 bu. per acre less than that following potatoes and 34.5 bu. per acre less than that following beets. As the stands and the treatment of these plats after planting were practically the same, the differences in yield appear to be due to the previous crops and their cultural treatment. Oats following fall-plowed flax, oats, and wheat, respectively, were fairly good. Wheat following oats was poor. The yields from continuous cropping were, in most cases, low."

In one rotation the alfalfa was pastured off with hogs. "During the whole season the hogs produced from the one-fourth acre alfalfa pasture and 41.3 bu. of corn a total of 988 lbs. of pork. Figuring this grain at 7.5 cts. a pound and the cost of the corn fed at 60 cts. a bushel, the local market prices at the time the experiment closed in 1913, the hogs returned an equivalent of \$49.24 for the one-fourth acre of alfalfa pasture. . . . Eleven similar plats of alfalfa were cut for hay and yielded an average of 5.46 tons per acre. Assuming that the yield from the pastured plat would have been the same as that from the 11 similar plats, the first lot of hogs paid an equivalent of \$37.71 per ton for the first cutting and the second lot paid \$35.33 per ton for the second and third cuttings, or an average for the season of \$36.13 per ton for alfalfa hay. To this must also be added the value of the manure left on the land."

In another rotation the corn crop was pastured off with hogs. "The hogs were on the corn plat 28 days. When they were taken off they weighed 800 lbs., having gained 253 lbs. from the one-fourth-acre corn plat, or 1,012 lbs. of pork per acre. This, at 7.5 cts. a pound, is equivalent to \$75.80 per acre. The daily gain was 1.3 per cent. A similar corn plat in the rotations yielded at the rate of 82.6 bu. of corn per acre. . . . Assuming that the yields from these two corn plats were the same, the hogs paid an equivalent of 93 cts. a bushel for the corn in the field. Figuring corn at 60 cts. a bushel and allowing \$10 per acre for alfalfa pasture, each pound of pork put on the hogs in the different lots cost as follows: The first lot on alfalfa, 3.1 cts.; second lot on alfalfa, 2.5 cts.; and the lot on corn, 4.9 cts."

Data give yields in variety tests of cereals for 1911, 1912, and 1913, comprising seven varieties of spring wheat, ranging from 31.9 to 37.6 bu. per acre, seven varieties of winter wheat ranging from 30.5 to 34.8 bu., three varieties of rye ranging from 25 to 27.3 bu., 16 varieties of barley ranging from 18.4 to 68.9 bu., and seven varieties of oats with yields ranging from 68.5 to 78.5 bu. per acre.

In 1913 14 varieties and crosses of corn gave an average yield of 33.5 bu., with a maximum yield of 43 bu. produced by the Blue Squaw variety. It is noted that the season in western Nebraska seems to be too short to mature grain sorghums. A comparison of stock beets with sugar beets gave an average yield of 35.5 tons per acre for three varieties, while sugar beets yielded 18 tons, indicating the desirability of growing stock beets rather than sugar beets for feeding purposes. The growth and yield of field peas in a test of six varieties for three years "do not warrant the growing of this crop under irrigation in western Nebraska." It seems that the cowpeas and spring varieties of vetch are of doubtful value for western Nebraska, while hairy vetch made good growth and survived the winter.

Preliminary experiments with pasture grass in irrigation were begun in 1913, involving tall oat grass, Italian rye grass, smooth brome grass, timothy, redtop, blue grass, wheat grass, orchard grass, meadow fescue, tall fescue, perennial rye

grass, red clover, alsike clover, and white clover. It is noted that all of the grasses made good growth during the summer except wheat grass, redtop, timothy, blue grass, and orchard grass.

Fall irrigation experiments with wheat, barley, oats, corn, potatoes, and sugar beets showed an average increase in yield of all the crops in favor of fall (September) irrigation amounting to 16 per cent. The increase with potatoes, however, seems to be insignificant, only 2 per cent, while with the other crops the increase was from 15 to 23 per cent.

Sugar beets cultivated to a depth of 3 in. throughout the season yielded an average of 16.3 tons for two years; a first cultivation to 3 in., subsequent cultivations shallow, and knife attachments on the cultivator, 18.3 tons; and shallow cultivation throughout the season 19.1 tons per acre.

Experiments in plowing 4, 8, 12, 16, and 20 in. deep for sugar beets showed that "while the results were not consistent, the highest yield was obtained from shallow plowing. The effect of varying the depth of plowing probably would differ on different soils. The soil at the experiment farm is a light sandy loam and probably does not require as deep plowing as heavier soils."

In an experiment regarding distance of planting sugar beets "rows were planted 20, 24, and 28 in. apart, and in each of these plantings the beets were thinned to 6, 9, 12, 15, and 18 in. in the row. The results so far obtained in this test have been very inconsistent, but in general the closer spaced plats have produced the highest yields."

In regard to potatoes "11 standard varieties of potatoes were tested in 1913, together with 21 seedling stocks. These were tested in single plats on land which grew alfalfa in 1912. The highest yield with the named varieties was produced by the Pearl, which yielded 314.9 bu. per acre. The Eureka was second, with a yield of 247.9 bu. per acre. One of the seedlings, not yet named, gave the highest total yield in 1913. It produced 370 bu. per acre." It is noted that with potatoes as with sugar beets summer rains interfered with irrigation plans and no consistent results were secured.

The tillage work consisted in deep and shallow ditching preparatory to irrigation. "The average yield in 1912 and 1913 for shallow ditching was 197.4 bu. per acre, as compared with 173.9 bu. per acre for deep ditching."

The work of the Yuma reclamation project experiment farm in 1913, R. E. BLAIR (*U. S. Dept. Agr., Bur. Plant Indus., Work Yuma Expt. Farm, 1913, pp. 1-11, figs. 4*).—This briefly outlines the work of the experiment farm located near Yuma, Ariz., as carried on jointly by several offices of the Bureau of Plant Industry, and continues previous studies (*E. S. R.*, 229, p. 330). Climatic and crop conditions of the project are briefly discussed.

In experimenting for a suitable green manure alfalfa was found to be the most satisfactory crop, although for a quick summer crop to turn under cowpeas seem to have given good results. In the production of alfalfa it is noted that in cases where the crop began to fail after three or four years, the subsoil proved to be unfavorable and prevented the taproot development and induced surface root system which did not prove sufficient for the needs of the crop. By plowing under the crop every two or three years and introducing a cultivated crop for a season, it is suggested that the soil would again be in condition to produce a maximum yield of alfalfa, for alfalfa seed is the chief money crop of this project. Cotton is suggested as being most suitable for this rotation.

In regard to the production of cotton on the alkali soils it is noted that "several significant observations were made upon the production of cotton from soil containing high percentages of alkali salts, chiefly sulphates and chlorids. Cotton was grown well on certain fields where other crops had previously been killed by the presence of excessive amounts of these salts. In one case where

determinations were made of the salt content it was found that cotton grew on a field containing more alkali in the surface three feet of soil than the adjacent field in which alfalfa seed had failed to grow. Experiments in volunteering cotton have been continued. A plat of Egyptian cotton was volunteered through the past winter to a stand of 91 per cent. Different planting methods have been practiced to ascertain the effect of volunteering for the following season."

Of seven varieties of grain sorghum tested in 1913 feterita gave the highest yield, 73 bu. per acre, followed by Dwarf milo maize with 41 bu. For forage or silage Red Kafir corn is noted as being superior.

Brief notes upon the successful trials of broom corn and hemp are given. Tunis grass produced the best hay yield when planted in 3-ft. rows and cultivated, while Sudan grass produced best when seeded broadcast as against 3-ft. row plantings. The former yielded at the rate of 4.2 tons per acre in three cuttings, and the latter 8 tons.

In experiments in regard to the water requirements of different crops it was observed that almost twice as much was used on light soils as on a medium soil by alfalfa, cotton, grain, sorghums, broom corn, hemp, and cowpeas for green manure.

[Field crops work at the Texas Station], 1913, B. YOUNGBLOOD (*Texas Sta. Rpt. 1913*, pp. 24-27, 28-30, 31-35, 35-55, 60-72).—These pages contain reports of the work for the year 1913 at the various substations of the State and include brief cultural notes with corn, cowpeas, sorghum, oats, rape, wheat, thousand-headed kale, rice, Chinese bean, Yokohama bean, beggar weed, kulthi bean, moth bean, tepary bean, Sudan grass, teosinte, *Dolichos lablab*, Japanese cane, guar, befri, *Cicer arietinum*, *Medicago obicularis*, jack bean, Kafir corn, milo maize, and peanuts, variety tests with vetches, cotton, wheat, corn, rice, soy beans, cowpeas, peanuts, and millet, and fertilizer tests with cotton and corn.

In studying the effect of source of seed corn it was found that for the three highest yielding varieties Texas seed gave 17.12; Virginia, 14.5; Louisiana, 12.7; and Georgia, 11.5 bu. per acre. In a similar test with cottons Georgia seed gave 971.6; Texas, 925.6; Tennessee, 612.3; and South Carolina, 566 lbs. per acre.

Experiments in crop production on fallow land at San Antonio, C. R. LETTEER (*U. S. Dept. Agr. Bul. 151 (1914)*, pp. 10, figs. 4).—From experiments conducted in 1911, 1912, and 1913 on one-quarter acre plats with corn, cotton, and winter oats, the author concludes that "the yields of corn and cotton have been less on biennially cropped land than on annually cropped land. The yields of winter oats have been somewhat larger on the biennially cropped land.

"Soil-moisture studies made in connection with these tests do not show any important differences in the amount of soil moisture present in fallowed land and in continuously cropped land at planting and harvest time for corn and cotton. In the plats used for oats there was more moisture present at planting and less at harvest time on the biennially cropped land than on the annually cropped land. In other words, the oats grown biennially used more water and made less vegetative growth, but gave larger yields. Observations made after heavy rains show that in most cases the proportion of run-off from heavy rains was greater on land which had been fallow for several months than on land which had been fallow for a comparatively short time. The run-off from an oat plat was less than from any of the fallow plats.

"Considering both crop yields and cost of production, the results of these experiments indicate that biennial cropping, at least for corn, cotton, and oats, is not to be recommended for the San Antonio region."

[Field crop experiments], F. WATTS (*Imp. Dept. Agr. West Indies, Rpts. Bot. Sta. [etc.] Montserrat, 1913-14, pp. 3-9, 13-16, pl. 1*).—This includes reports of variety tests with cotton that not only consider yield of seed cotton, but length of staple, percentage of lint, strength, fineness, good fiber per 50 seeds, weak fiber per 50 seeds, short fiber per 50 seeds, weight of 200 seeds, and weight of lint; manurial tests with cotton that show a depressed yield with the application of any kind of commercial fertilizer over untreated areas; field tests with hybrid cotton, and variety tests of sweet potatoes and peanuts.

[Field crop experiments], D. W. SCOTLAND (*Ann. Rpt. Agr. Dept. Sierra Leone, 1912, pp. 5-14*).—This reports results of field trials at the experimental station at Jala, Mano, with rice, peanuts, ginger, yams, towé beans, hondroi beans, kroo beans, black gram, pigeon pea, Bengal gram, lablab (*Dolichos lablab*), soy beans, milo maize, Guinea corn, bulrush millet, ragi (*Eleusine coracana*), korra (*Setaria italica*), castor bean, cotton, millet, and benni seed (*Sesamum indicum*).

In rice experiments it is shown that $1\frac{1}{2}$ bu. of seed gave larger yields, 30.2 bu. per acre, than either a larger or smaller quantity. With the native method of sowing millet and benni seed with the rice ($\frac{1}{2}$ bu. per acre), the average yield was 16.8 bu. of rice, 177 lbs. of millet, and 24 lbs. of benni seed per acre. Rice that was kept weeded averaged 26 bu. per acre and that left uncultivated yielded 11 bu. per acre.

Agriculture in the Tropics, J. C. WILLIS (*Cambridge, England, 1914, 2. rev. ed., pp. XVI+223, pls. 24*).—This is a second edition with slight changes of the book previously noted (E. S. R., 21, p. 631).

Natural revegetation of range lands based upon growth requirements and life history of the vegetation, A. W. SAMPSON (*U. S. Dept. Agr., Jour. Agr. Research, 3 (1914), No. 2, pp. 93-148, pls. 12, figs. 6*).—This article gives the results of an investigation to determine a system of grazing that would overcome the deteriorating effect of premature grazing and overstocking, as well as of trampling, in the extensive ranges of the western United States.

As the result of a careful and scientific study of the vegetation making up the forage, and of the natural factors upon which depends the success or failure of this crop and its perpetuation, a grazing system involving a combination of deferred and rotation grazing has been developed which is now being applied with minor variations to range lands throughout the National Forests.

Included in the notes on character and distribution of the vegetation on these ranges, aside from timber, is a list of 46 plants which, it is stated, comprise about 90 per cent of the range forage.

The summary of the findings of this investigation, which began in 1907 in the Wallowa Mountains of northeastern Oregon and was undertaken by the Forest Service and Bureau of Plant Industry of this Department, is as follows:

“Normally the spring growth of forage plants begins in the Hudsonian zone about June 25. For each 1,000 ft. decrease in elevation this period comes approximately seven days earlier. In the Wallowa Mountains the flower stalks are produced approximately between July 15 and August 10, while the seed matures between August 15 and September 1. Even under the most favorable conditions the viability of the seed on summer ranges is relatively low. Removal of the herbage year after year during the early part of the growing season weakens the plants, delays the resumption of growth, advances the time of maturity, and decreases the seed production and the fertility of the seed. Grazing after seed maturity in no way interferes with flower-stalk production. As much fertile seed is produced as where the vegetation is protected from grazing during the whole of the year.

"Germination of the seed and establishment of seedlings depend largely upon the thoroughness with which the seed is planted. In the case of practically all perennial forage species the soil must be stirred after the seed is dropped if there is to be permanent reproduction. Even after a fertile seed crop has been planted there is a relatively heavy loss of seedlings as a result of soil heaving. After the first season, however, the loss due to climatic conditions is negligible. When three years old, perennial plants usually produce flower stalks and mature fertile seed.

"Under the practice of yearlong or season-long grazing both the growth of the plants and seed production are seriously interfered with. A range so used, when stocked to its full capacity, finally becomes denuded. Yearlong protection of the range favors plant growth and seed production, but does not insure the planting of the seed. Moreover, it is impracticable, because of the entire loss of the forage crop and the fire danger resulting from the accumulation of inflammable material. Deferred grazing insures the planting of the seed crop and the permanent establishment of seeding plants without sacrificing the season's forage or establishing a fire hazard. Deferred grazing can be applied wherever the vegetation remains palatable after seed maturity and produces a seed crop, provided ample water facilities for stock exist or may be developed.

"The proportion of the range which should be set aside for deferred grazing is determined by the time of year the seed matures. In the Wallowa Mountains one-fifth of the summer grazing season remains after the seed has ripened, and hence one-fifth of each range allotment may be grazed after that date. The distribution of water and the extent of overgrazing will chiefly determine the area upon which grazing should be first deferred. After the first area selected has been revegetated it may be grazed at the usual time and another area set aside for deferred grazing. This plan of rotation from one area to another should be continued, even after the entire range has been revegetated, in order to maintain the vigor of the forage plants and to allow the production of an occasional seed crop."

Influence of potassic fertilizer on legumes, G. BARONTINI (*Coltivatore*, 60 (1914), No. 29, pp. 332-334).—This paper presents the results of experiments which show the advantage of the use of potassium in increased yields and quality of red clover forage and seed, and also the increased yield of wheat following clover that had been so fertilized.

Practical corn culture, W. T. and R. M. AINSWORTH (*Mason City, Ill.*, 1914, pp. 166, pl. 1, figs. 40).—This book is divided in three parts. Part 1, on culture, discusses the preparation of the seed bed, planting, and cultivation. Part 2, on building up the land, discusses the rotation of farm crops, leguminous crops, stable and barnyard manures, and phosphorus and limestone. Part 3, the seed, includes chapters on selecting the best ears for seed, the "ear to the row" breeding plat, drying and storing seed corn, preparing seed corn for planting, and insect enemies and plant diseases. An appendix consists of letters from 30 practical farmers describing their methods of corn culture.

Report of the work in corn pollination, IV, M. L. FISHER (*Proc. Ind. Acad. Sci.*, 1912, p. 87).—This article gives results of continued work with the Sweet-Reid Yellow Dent cross in corn (E. S. R., 30, p. 635). In 1912 the characteristics of the two types of this cross were as follows:

"The light-colored type had large ears, white in color. Upon cooking the flavor was found to be excellent, being very sweet. The sweet flavor combined with a long grain makes this a very desirable type. The cooking test showed it to be superior to the corn bought on the market in West Lafayette. The yellow type had a medium-sized ear, creamy white in color, and when cooked

had also an excellent, sweet flavor. The flavor was considered not quite so good as that of the light-colored type.

"At maturity the light-colored type showed itself quite true to type, having whitish kernels, red cobs, and large size. There were few yellow dent kernels, probably no more than due to cross-pollination from adjoining plats. The yellowish type had smaller ears, mostly white cobs, yellowish kernels, and a larger proportion of yellow dent kernels than the other type. The yellowish type does not have the depth of kernel that the whitish type possesses."

Cotton, F. WATTS (*Imp. Dept. Agr. West Indies, Rpts. Bot. Sta. [etc.] Montserrat, 1911-12, pp. 3-6*).—This gives brief notes on variety tests of Im-mune, Sakellaridis, and other cottons, and hybrids.

Economic conditions in the Sea Island cotton industry, W. R. MEADOWS (*U. S. Dept. Agr. Bul. 146 (1914), pp. 18*).—This bulletin gives results of inquiries to determine the cause for the low price of Sea Island cotton in 1913, and discusses Egyptian competition, causes of decreased consumption, and conditions among the producers of South Carolina, Georgia, and Florida. It places the cause of depression of prices on underconsumption brought about by (1) the deadlock of 1912-13 between spinners and growers; (2) the competition of the Sakellaridis variety; (3) the deteriorated quality of Sea Island cotton; and (4) change in styles and enforced economy of production.

Notes on the cotton of Cambodia, M. DE FLACOURT (*Bul. Écon. Indochine, n. ser., 17 (1914), No. 107, pp. 212-215*).—This gives results of studies of bolls of three varieties of cotton, some of which are three- and some four-celled. The percentage of fiber for a four-celled variety averaged for 20 bolls 32.5 per cent, and for two varieties with three-celled bolls 24.8 and 34.8 per cent, respectively. Tabulated data include weight of boll without shell, weight of fiber, and weight of seed.

Flax from the East Africa Protectorate (*Bul. Imp. Inst. [Sô. Kensington], 12 (1914), No. 2, pp. 211-213*).—This article gives data obtained in the examination of samples of flax grown in the Highland districts of the East Africa Protectorate. The fiber merchants in London, who valued the samples, reported very favorably on them, regarding them as superior to Russian flaxes and more comparable with the Belgian kinds.

Guinea corn (*Jour. Jamaica Agr. Soc., 18 (1914), No. 8, pp. 344, 345*).—This article records the excellent showing that Guinea corn (durra), especially the red variety, has made in times of drought in Jamaica.

Hemp, H. H. COUSINS (*Jour. Jamaica Agr. Soc., 18 (1914), No. 8, pp. 334-336*).—This article gives a history of the introduction and cultivation of *Agave fourcroides* and *A. sisalana* in Jamaica. The first introduction seems to have taken place about 1855 from Yucatan.

Better methods of potato production for Iowa, L. GREENE and T. J. MANEY (*Iowa Sta. Bul. 149 (1914), pp. 65-81, figs. 3*).—The methods here reported consisted of spraying experiments, variety tests, selection of best hills as a means of increasing yield, and a comparison of different planting dates as they influence the yield of the main or late crop of potatoes. It is noted that "in 1910 six sprayings gave an increase of 61.56 bu. of marketable tubers over the check; in 1911, five sprayings gave an increased yield of 36.94 bu., and in 1912, seven sprayings increased the yield 33.6 bu." The estimated cost of spraying with Bordeaux mixture and lead arsenate is \$1 per acre.

Eight varieties of early and 12 varieties of late potatoes are described, and results of yields for 1910, 1911, and 1912 are given that show Prosperity ranking first as a late potato and Irish Cobbler as an early variety, with yields of

132.54 and 116.42 bu., respectively. Rural New Yorker is noted as more extensively grown throughout the State than any other variety.

The following statement is made in regard to the results of selecting the best and the poorest hills under test: "In making selections those hills which had an average number of well-formed, medium-sized tubers for the variety were selected. These hills could, as a rule, be chosen by the appearance of the vines, though this was not always true. This method of seed selection would prove profitable to the grower if he could set aside a small seed plat and select his next year's seed from it. The results are striking in that the yield was increased 50 bu. by taking the best and poorest seed only one year. By taking the best seed from each of these lots of seed the strain with quality behind it still outyielded the poorest strain [the following year] by nearly 50 bu."

The data presented in regard to the influence of planting date upon yield indicate that the soil temperature as affected by weather is more influential than is the date. The inconclusive results obtained from a three-year experiment that indicates about the best time for planting has been that following the corn planting, or from May 10 to May 25.

The effect of potato scab treatment on seed vitality.—Better methods of potato production for Iowa, T. J. MANEY and L. GREENE (*Iowa Sta. Buls. 148 and 149, popular ed. (1914), pp. 8*).—This is a popular edition of Bulletins 148 (abstracted on page 240) and 149, abstracted above.

Xenia (?) in rice, H. O. JACOBSON (*Philippine Agr. Rev. [English Ed.], 7 (1914), No. 9, p. 361*).—This notes the appearance of two pinkish colored kernels of rice appearing in a head of variety No. 73, which is a white variety. "These two kernels were planted separately and crops therefrom matured. One kernel (*a*) produced white kernels only, while the second kernel (*b*) produced nothing but red-cuticled kernels. Each lot was again planted separately and the (*a*) lot when harvested contained 6 per cent of red-cuticled kernels. The (*b*) lot produced 24 per cent of white kernels, the remainder being red. In no case were red and white kernels found in the same head, of course. It is plainly evident that the (*b*) kernel was a hybrid produced through cross-fertilization by the pollen from some near-by red-cuticled variety."

Head-to-the-row test with rice, H. O. JACOBSON (*Philippine Agr. Rev. [English Ed.], 7 (1914), No. 9, pp. 346-351, pls. 2*).—This article describes a method of head-to-the-row selection, and gives some results that show great possibilities in rice improvement. Observations are noted as being taken and recorded on 27 variable characteristics of individuals within each variety under trial, that of yield being most marked and important. The yield of 100 plants, the progeny of single heads, was at the rate of from 375 to 6,625 kg. of rough rice per hectare, all within the same variety.

The transplanting of rice, P. and G. GREGOTTI (*Gior. Riscicoll., 4 (1914), No. 20, pp. 301-307, figs. 3*).—This article gives data of work done at Valencia, Spain, showing the advantage secured both in yield and in actual profits by the practice of transplanting rice in the field.

Drilling-fertilizer experiments with sugar beets in Hungary in 1912, J. GYÁRFÁS (*Österr. Ungar. Ztschr. Zuckerindus. u. Landw., 42 (1913), No. 6, pp. 883-893, pl. 1*).—The results given show larger yields where the fertilizer is applied in drills at seeding time than when broadcasted, in some cases even when only one-half the amount was drilled that was applied broadcast.

Can sodium, wholly or partially, replace potassium as a fertilizer for sugar beets? KRÜGER (*Ztschr. Ver. Deut. Zuckerindus., No. 703, II (1914), pp. 694-702*).—This article gives the results of a pot experiment in which potash in varying quantities was given and sodium was supplied in quantities to equal the deficiencies in potash that would be required to produce a maximum yield

of sugar beets in the pots. The tabulated results of the harvests, showing green weights, sugar content, and potash content, were such as to induce the author to conclude that sodium can not physiologically replace potassium in cultivated plants, particularly the sugar beet, but that its presence has an indirect influence such as to allow the plants to utilize more readily increased quantities of potassium.

The future of sugar cane and the sugar industry in Mexico, L. FOURTON (*El Porvenir de la Caña de Azúcar y de la Industria Azucarera en Mexico. Mexico, 1914, pp. 31*).—This booklet reviews the sugar industry of Mexico since 1898, and discusses the manufacture of sugar and alcohol, briefly touching upon the production of sugar cane.

Sweet clover, V. M. SHOESMITH (*Michigan Sta. Circ. 23 (1914), pp. 151-156, figs. 4*).—This circular describes cultural methods and uses of sweet clover for Michigan conditions.

Experiment in the selection of seeds, C. GRIFFIN (*Univ. Nac. La Plata, Facult. Agron. y Vet., 1913, pp. 63-70, pl. 1*).—This article gives results in seed selection of wheat that show increased yields amounting to 435.25 kg. per hectare. The selection was based upon the size, weight, specific gravity, and purity of the seed.

Thirteen years of wheat selection, T. B. HUTCHESON (*Amer. Nat., 48 (1914), No. 572, pp. 459-466, figs. 3*).—In this article the author gives results of pure line selections of six varieties of wheat that show no permanent change in point of yield, height of plant, and length of upper internode, in 13 years of breeding at the Minnesota Station.

The physiological selection of Tuscany wheat, F. RAMPAZZO (*Atti R. Accad. Econ. Agr. Georg. Firenze, 5. ser., 10 (1913), No. 3, pp. 253-272*).—This paper discusses the value and importance of improvement in wheat in general, and gives some results of selection which show that there is a correlation between productiveness and the disposition of the spikelets on the rachis, and that a short, thick spike corresponds to increased productiveness.

Varieties of wheat in Semiretchinsk, K. FLAKSBERGER (*Trudy Būro Prikl. Bot. (Bul. Angew. Bot.), 3 (1910), No. 3, pp. 62-165, figs. 12*).—This discusses wheat found in northern Turkestan by the author, and describes 24 varieties.

Further observations on wheat, K. FLAKSBERGER (*Trudy Būro Prikl. Bot. (Bul. Angew. Bot.), 7 (1914), No. 8, pp. 493-502, pl. 1, fig. 1*).—Differences discovered in the formation of the glumes of the spring wheat (*Triticum vulgare albidum inflatum*) are described which indicate certain forms to be of the winter wheats. (See above.)

Bulk handling of wheat, compiled by H. V. JACKSON (*Dept. Agr. N. S. Wales, Farmers' Buls. 13 (1908), pp. 67, figs. 23; 13, 2. ed. (1912), pp. 71, figs. 16; 85 (1914), pp. 15*).—These bulletins give in detail methods of handling bulk wheat at elevators, silos, and public warehouses, and the grades used, in the United States, Canada, and Great Britain.

Iowa seed analyses, 1910-1913, L. H. PAMMEL and CHARLOTTE M. KING (*Iowa Sta. Bul. 146 (1914), pp. 413-440*).—This bulletin gives the results of purity and germination tests of seed for the years 1910-1913, including some germination studies of clover, alfalfa, and timothy. It is noted that under the state seed law seed conditions have become much better, and the presence of dodder, Canada thistle, and the like is much less frequent than formerly.

In 1910, 286 samples of commercial seed were examined and in 1913, 1,058. In 1913 the general average of purity is noted as having been high except in the case of sweet clover, which had an average of only 74.2 per cent pure for 35 samples. A total of 465 tests of red clover samples showed 96.72 per cent purity. A total of 168 tests of timothy samples showed 97.75 per cent purity.

The average purity of 112 samples of alfalfa seed was 97.3 per cent. The average germination of the principal seeds was high.

In a study of vitality of commercial seeds it was found that "the highest germination of alsike clover, three years old, was 95 per cent, the lowest 70 per cent. The highest for 2-year-old seed was 92 per cent, the lowest 68 per cent. The highest for 1-year-old seed was 96 per cent, the lowest 69 per cent. The highest for 3-year-old seed for alfalfa was 90 per cent, the lowest 83 per cent. For 2-year-old seed the highest was 92 per cent, the lowest 75 per cent. For 1-year-old seed the highest was 98 per cent, the lowest 62 per cent. The highest percentage of germination for 3-year-old red clover was 91 per cent, the lowest 54 per cent. For 2-year-old seed the highest was 96 per cent, the lowest 66 per cent. For 1-year-old seed the highest was 97 per cent, the lowest 66 per cent."

A study of the vitality of the hulled and unhulled timothy seeds covering a period from 1909-1913, inclusive, shows that the hulled seeds averaged 61.4 per cent in germination power, as compared with 90.7 per cent for the unhulled seeds.

A bibliography of 42 titles is appended.

A manual of weeds, ADA E. GEORGIA (*New York, 1914, pp. XI+593, figs. 387*).—In this book the author discusses the definition of a weed, and also touches briefly upon the financial loss due to weeds, the dissemination of weeds, and chemical herbicides. The bulk of the book consists of a descriptive list and means of control of weeds, followed by a list of plants distinctly poisonous or mechanically harmful to animal life.

HORTICULTURE.

The development of gardening, with special reference to conditions in Dresden, K. HOFMANN (*Die Entwicklung der Gärtnerei unter besonderer Berücksichtigung der Verhältnisse in Dresden. Leipzig, 1913, pp. VIII+87, pls. 30*).—In this paper the author briefly reviews the history of gardening, and discusses in detail the market gardening and floricultural industries in the vicinity of Dresden, with special reference to their economic status in both the agricultural and industrial world.

The garden at home, H. H. THOMAS (*London, New York, Toronto, and Melbourne, 1912, pp. XII+276, pls. 108*).—A popular treatise on gardening, dealing primarily with ornamental gardening but containing also suggestions relative to the home fruit and vegetable garden.

[Report on horticultural investigations at the Yuma Experiment Farm, 1913], R. E. BLAIR (*U. S. Dept. Agr., Bur. Plant Indus., Work Yuma Expt. Farm, 1913, pp. 11-18, figs. 2*).—A brief progress report on cultural and variety tests of dates, figs, deciduous fruits and nuts, vegetables, and ornamentals being conducted at the farm.

In the work with dates seedling plants representative of nine promising varieties are being grown in experimental orchards. Despite a minimum temperature of 16° F. on January 6, 1913, it was found that 66 per cent of the seedling plants had received less than 50 per cent of leaf injury. The remaining seedlings were alive although more seriously damaged. The Smyrna Adriatic fig hybrids mentioned in a previous report (*E. S. R., 29, p. 338*) bore their first fruit during the summer of 1913. Of 1,600 seedlings in all, 54 bore and matured fruits of good quality, but owing presumably to injuries received during the preceding winter 1,219 trees did not flower. Observations made during the two winters show some variation in frost resistance among these seedlings. An

extensive variety test of deciduous fruits and nuts has been established. The pomegranate has been found to be well adapted to the local soil and climate. The best of the named varieties thus far tested are "Sweet Fruited" and "Wonderful."

Notes are given on the varieties of vegetables which have produced the best results, together with suggestions as to cultural methods. During the spring of 1913 a number of ornamental plants were set out for testing. Of those already growing at the farm the ornamental date palm (*Phoenix canariensis*) and the weeping fan palm (*Washingtonia filifera*) have proved very desirable, both as specimen trees and for street plantings.

[Report of the] citrus experiment station, H. J. WEBBER (*California Sta. Rpt. 1914, pp. 60-67, 72*).—A progress report on the various horticultural projects being conducted at the citrus substation.

Some data are given on fertilizer experiments with oranges and lemons. The results thus far indicate the importance of nitrogen fertilization and the desirability of using nitrogen from organic sources rather than from such chemicals as nitrate of soda. Among the green manure crops which are being tested with special reference to their use in citrus orchards in southern California, purple vetch and melilotus clover are especially promising. For the one season tested purple vetch gave a yield of 18.25 tons of green tops. It is so vigorous in growth that it entirely chokes out all weeds and is resistant to aphid attack. During a 4-year period melilotus clover has given an average yield of 12.75 tons. It is found growing wild all over the southern part of California, is apparently adapted to a great variety of soil types, is very deep-rooted, resistant to aphid attack, and also withstands quite low temperatures. Some data are given showing the increases in yields of corn, potatoes, and sugar beets following the use of various cover crops. The greater yields following the use of leguminous cover crops as compared with nonleguminous cover crops clearly indicate the importance of legumes in adding nitrogen to the soil.

A comparative test is being made of the Washington navel and Valencia oranges and the Eureka lemon grown upon sweet, sour, and trifoliate orange stock and upon pomelo. As determined by the results thus far secured it appears that varying soil conditions may modify the influence of various stocks on oranges and lemons. A marked dwarfing of lemon trees grown on trifoliate stock was noted in every instance. There was also an increased diameter on the trifoliate stock below the bud union in practically all cases. In point of fruit production the navel orange appears to yield best on sour stock, followed by sweet, with Trifoliata stock third. In case of the Eureka lemon, pomelo was the best stock with sour, sweet, and Trifoliata following in the order named.

A brief progress report is given of other studies being conducted.

[Report on horticultural investigations at the Scottsbluff experiment farm, 1913], F. KNORR (*U. S. Dept. Agr., Bur. Plant Indus., Work Scottsbluff Expt. Farm, 1913, pp. 18, 19, fig. 1*).—A brief statement of progress made in the work of testing fruits, vegetables, shade trees, and ornamental shrubs during the year 1913.

The severe winter of 1912-13 was very hard on fruit trees, a number of varieties being frozen almost to the ground. Of the apples the Anisim, University, Patten, Northwestern, Hibernial, Florence Crab, Whitney Crab, and Hyslop Crab withstood the winter well. Wealthy, Oldenburg, Yellow Transparent, and White Pearmain froze almost to the ground, but the trees made a vigorous growth in the spring. Of the pears only one tree, of the Seckel, came through the winter successfully. Unprotected raspberries, including the Sun-

beam, which is advertised as winter hardy, froze to the ground line. Of the trees being tested at the farm, the hackberry and green ash have proved very hardy. A large number of trees and shrubs were planted for testing in the spring of 1913.

A detailed report of the work with vegetables has previously appeared in Bulletin 142 of the Nebraska Station (E. S. R., 31, p. 336).

[Report on] genetics, E. B. BABCOCK (*California Sta. Rpt. 1914*, pp. 120-123, fig. 1).—A progress report on plant breeding investigations at the station, including some data on a study of the Quercina walnut which has been previously noted (E. S. R., 32, p. 46).

In the work with tomatoes, second generation plants have been grown from certain crosses made in 1911. The author states that the results generally agree with those secured by Gilbert (E. S. R., 28, p. 539).

Precooling and handling investigations with oranges and lettuce, Florida, season 1913-14, H. J. RAMSEY (*Proc. Fla. State Hort. Soc.*, 27 (1914), pp. 199-210).—In continuation of the Bureau of Plant Industry's investigations relative to the handling of citrus fruits (E. S. R., 31, p. 338), precooling investigations with oranges were conducted during the season of 1913-14.

The first season's results as here reported show that precooling has a decided influence in retarding the decay of oranges. In several commercial handled lots of oranges, both precooled and nonprecooled, which were held in an iced car for ten days, there was three times as much decay in the nonprecooled as in the precooled fruit when the oranges were removed from the car. One week later the nonprecooled fruit showed almost twice as much decay as the precooled, and the differences were still consistent but not so great two weeks after withdrawal from the car. Data obtained from actual shipping experiments were not so satisfactory owing to the impossibility of having the cars sent to the same market. The results emphasize, however, the importance of careful handling as a factor in the control of decay.

Data are also given on the precooling and handling of lettuce. The results show in general that by changing somewhat the methods of handling the crop lettuce can be landed at the northern markets in much better condition than is now common. The most important change in handling consists in removing the heads in the field so as to leave the more or less diseased bottom leaves attached to the roots, thus preventing the spread of disease to the shipping baskets. The effect of careful cutting was more pronounced than that of precooling, although the precooled lots reached the market in noticeably better condition than the nonprecooled lots.

Stocks for fruit trees, U. P. HEDRICK (*Mo. Bul. Com. Hort. Cal.*, 3 (1914), No. 11, pp. 449-455).—An address delivered before the State Fruit Growers' Convention, Davis, Cal., in June, 1914, in which the author points out various ways in which the stock may influence the scion, and calls attention to the desirability of using selected stocks as well as selected scions.

Practical orchard pruning, F. J. CRIDER (*South Carolina Sta. Bul. 176* (1914), pp. 7-47, figs. 13).—This bulletin contains practical instructions for pruning orchard fruits, grapes, and bush fruits.

Bridge grafting (*Michigan Sta. Circ. 21* (1914), p. 1, fig. 1).—A popular description of the process.

[Report of investigations with grapes and olives], F. T. BIOLETTI (*California Sta. Rpt. 1914*, pp. 185-189, 194-198).—Experiments were made in three bearing vineyards to determine the effects of early and late pruning of vines. Pruning before the leaves fall in autumn delayed the starting of buds slightly.

Pruning the vines after the terminal buds have started was found to delay the starting of the buds near the base of the canes. Delayed pruning in one instance saved the crop from a subsequent frost. Whitewashing the vines after pruning delayed the starting slightly. Late pruning, after the starting of the buds, was found to delay blossoming, but when early pruning resulted in frost injury to the buds the late pruned vines blossomed first. Frost injury in spring diminished the crop of early pruned vines, whereas pruning after the terminal buds had started seemed to increase the crop irrespective of frost injury. Pruning after the shoots had grown several inches seemed to diminish the crop. Late pruning delayed the ripening of the grapes, and pruning as late as May decreased the quality of the grapes.

A test of hot water as a means of disinfecting cuttings and rooted vines indicates that either cuttings or roots may be safely disinfected from phylloxera by immersion in water at 55° C. for five minutes. Some data are given on a study of the relation of the degree of ripeness of the Muscat grapes to the quality and quantity of the crop of raisins. The evidence obtained shows the advisability of allowing Muscat grapes to become very thoroughly ripe before gathering for raisins. The gain is sufficiently marked to cover the added expense of protecting the raisins from rains during early rainy seasons. In a study of the process of cap-stemming Sultanina raisins, it was found that much of the failure to cap-stem readily is due to an excess of moisture in the raisins.

Data are reported on some tests which were made to determine a practicable method of eliminating bad olive seed and of hastening the germination of good olive seed. In 16 samples examined the proportion of bad seed varied from none to 46 per cent. It was found possible to separate bad seed by using a salt solution, the best concentration of the solution depending on the condition of the seeds. Seeds freshly separated from the pulp gave the best separation in a solution containing 25 parts of salt to 100 parts of water by weight, the good seed sinking to the bottom. Dried seeds gave the best separation in a 10 per cent salt solution. After soaking dried seeds for two days in water, satisfactory separation was obtained, as with fresh seed, in a 25 per cent salt solution. Cutting off the apex of the seed was found the most effective aid to germination. Seeds of naturally poor germinating powers gave better results when the apex was cut than seeds of good germinating power when untreated. When planted with the pulp the germination was very slow, none of the seeds starting within five months.

Cacao, Y. HENRY (*Le Cacao. Paris, 1913, pp. 105, pl. 1, figs. 13*).—A treatise on cacao with reference to its production, commerce, culture, and preparation on the west coast of Africa.

The development of female sexual organs in *Theobroma cacao*, J. KUIJPER (*Rec. Trav. Bot. Néerland., 11 (1914), No. 1, pp. 37-43, pl. 1, figs. 7*).—In a study of the development of the female sexual organs of cacao flowers, here illustrated and described, the author finds that the development is entirely normal.

First report on cacao selection, C. J. J. VAN HALL (*Meded. Proefstat. Midden-Java, No. 10 (1913), pp. 45*).—This is the first report on selection studies with cacao trees being conducted under the direction of the Experiment Station for Central Java. Data are given on the work conducted in 1912.

Second report on cacao selection at Djati Roenggo, E. E. L. MACGILLAVRY and C. J. J. VAN HALL (*Meded. Proefstat. Midden-Java, No. 16 (1914), pp. 10, figs. 3*).—A progress report on that part of the above noted selection studies with cacao trees which is being conducted at Djati Roenggo, Java.

Second report on cacao selection at Getas, A. H. MEYER and C. J. J. VAN HALL (*Meded. Proefstat. Midden-Java, No. 17 (1914), pp. 15, figs. 2*).—A similar progress report on that part of the above noted cacao selection studies that is being conducted at Getas, Java.

A study of the factors influencing seed formation in citrus fruits, J. E. COIT (*California Sta. Rpt. 1914, pp. 105, 106*).—This comprises a brief summary of the results thus far secured in this investigation.

The results indicate that cross pollination is unnecessary in all naturally fertile varieties of orange trees and that pollination takes place without the activity of insects. Viable pollen of parthenocarpic varieties is either entirely wanting or is very scarce. Consequently these varieties bear fruit without pollination. "The time required for complete fertilization after pollination varies with the variety, from 30 hours in the Satsuma orange to four weeks in the trifoliolate orange. Disintegration of the embryo sacs sometimes takes place in the Washington navel and Satsuma oranges. It may occur before the formation of the megaspores, but usually not until afterwards. Some normal embryo sacs are produced in occasional fruits of both Washington navel and Satsuma oranges. Thus a few seeds may be produced, provided these particular fruits happen to be pollinated with viable pollen from fertile varieties. It is the remoteness of the chance of this occurring under ordinary field conditions that accounts for the seedlessness of these fruits. There appears to be nothing in the structure of the flowers of either the Washington navel or the Satsuma oranges which would interfere in any way with the germination of pollen or normal extension of the pollen tube. Parthenocarpic citrus varieties are probably hybrids between naturally fertile varieties."

The present condition of citrus growing in Spain, J. M. PRIEGO (*Internat. Inst. Agr. [Rome], Mo. Bul. Agr. Intel. and Plant Diseases, 4 (1913), No. 2, pp. 161-166*).—A short general and statistical account of the citrus industry in Spain.

The coconut, OCTAVE J. A. COLLET (*La Noix de Coco. Paris and Brussels, 1913, pp. 176, figs. 33*).—A treatise on the coconut with reference to its botany, plantation culture and management, and the preparation of copra, coconut oil, and other products. The subject matter is based primarily upon a study of the industry as conducted in various tropical countries.

Manurial experiments on coconuts, 1913-14, J. DE VERTEUIL (*Bul. Dept. Agr. Trinidad and Tobago, 13 (1914), No. 83, pp. 267-276, pl. 1*).—This report deals with the third year's results of manurial experiments on coconuts being conducted under the direction of the Trinidad Board of Agriculture (E. S. R., 30, p. 644).

Although no conclusions are drawn from the work as yet, the results for the third season failed to show any decided gains by the use of commercial fertilizers.

Second report on selection tests of Robusta coffee, C. VOÛTE and C. J. J. VAN HALL (*Meded. Proefstat. Midden-Java, No. 15 (1914), pp. 16, figs. 6*).—A progress report on breeding and selection experiments with Robusta coffee in Java (E. S. R., 30, p. 43).

Some aspects of modern tea pruning, G. D. HOPE and P. H. CARPENTER (*Calcutta: Indian Tea Assoc., 1914, pp. 57+IV, pls. 12*).—A discussion of the principles and practice of pruning, with special reference to the tea plant.

Report on the botanic gardens and their work, J. F. WABY (*Rpt. Dept. Sci. and Agr. Brit. Guiana, 1912-13, App. 2, pp. 19*).—A report on the botanic gardens of British Guiana for the year 1912-13, including notes on the character and condition of ornamentals and economic plants being tested.

FORESTRY.

The place of forestry among natural sciences, H. S. GRAVES (*Jour. Wash. Acad. Sci.*, 5 (1915), No. 2, pp. 41-57).—A paper on this subject delivered before the Washington Academy of Sciences, December 3, 1914.

Forests and floods, F. M. ANDREWS (*Proc. Ind. Acad. Sci.*, 1913, pp. 203-212).—A partial review of the literature of the subject.

Tree growth and meteorological factors, J. C. KAPTENY (*Rec. Trav. Bot. Néerland.*, 11 (1914), No. 1, pp. 70-93, pls. 2).—A contribution to the knowledge of this subject based on measurements made of oak trees in different sections of Germany some 30 years ago. The data are presented now largely with the view of stimulating more fundamental work along this line.

Report on an investigation into the current annual increment in girth at 5 feet above ground of a Douglas fir plantation, 32 years of age, in the Quarries Wood on the Benmore Estate, Kilmun, Cowal District of Argyllshire, during the year 1911, J. NISBET (*West of Scot. Agr. Col. Bul.* 59 (1912), pp. 11).—This is the first report on measurements of a sample plat of nearly pure Douglas fir which was ring banded in 1911 and is to be kept under continuous observation year by year. From the data already secured it is estimated that the current increment is about 150 cu. ft. per acre and per annum.

Notes on germination and reproduction of longleaf pine in southern Mississippi, P. L. BUTTRICK (*Forestry Quart.*, 12 (1914), No. 4, pp. 532-537, pl. 1).—A contribution to the knowledge of longleaf pine reproduction, based on data collected partially by the senior class of the Yale Forest School and partially by the author.

The distribution of mountain pine (*Pinus montana*) in the eastern central Alps, F. VIERHAPPER (*Österr. Bot. Ztschr.*, 64 (1914), No. 9-10, pp. 369-407).—A review of the literature of the subject, including a bibliography of the cited literature.

Average returns from the afforestation of waste lands, P. T. MAW (*Quart. Jour. Forestry*, 9 (1915), No. 1, pp. 18-33).—A discussion of this subject in which the author compares the results of observations made in Great Britain with results obtained in Germany.

Sixth annual report of the state forester.—Progress of forestry in Vermont, A. F. HAWES (*Ann. Rpt. State Forester Vt.*, 6 (1914), pp. 63, pls. 5).—Consideration is given to the topics of needed legislation, forest taxation, educational work, assistance rendered to private owners, nursery and planting operations on the different State forests, and forest fires.

Report of state forester, F. A. ELLIOTT (*Ann. Rpt. State Forester Oreg.*, 3 (1913), pp. 46).—The present report comprises a concise record of the fire losses and of the work performed by state and private agencies in safeguarding the forest wealth of the State.

Summary of the results of the Saxony state forest administration for the year 1913 (*Tharand. Forstl. Jahrb.*, 65 (1914), No. 4, pp. 346-350).—A statistical review relative to forest areas, yields in major and minor forest products, revenues, expenditures, etc., for the various districts of Saxony, with comparative data for the year 1912.

Notes on forestry in Russia (*Forestry Quart.*, 12 (1914), No. 4, pp. 567-577).—Descriptive notes on forest organization, investigations, and practices in Russia, the subject matter being based on a conversation with M. Tkatchenko, of the Russian Department of Forestry.

Annual return of statistics relating to forest administration in British India, 1912-13 (*Ann. Return Statis. Forest Admin. Brit. India*, 1912-13, pp.

27, *pl. 1*).—A progress report on forest administration in British India, including a financial statement for the year 1912-13. Data relative to forest areas, working plans, protection, forest surveys, yields in major and minor forest products, revenues, expenditures, etc., are appended in tabular form.

[Report of the] forestry section, W. R. RUTTER (*Ann. Rpt. Bot., Forestry, and Sci. Dept. Uganda, 1914, pp. 7-13*).—A brief progress report of forest operations in the Uganda Protectorate for the year ended March 31, 1914.

Annual report of subdepartment of forests, S. A. WOOD (*Rpts. Finance, Admin., and Condition Sudan, 1913, vol. 2, pp. 165-189*).—A progress report on the administration, management, and exploitation of the forests of the Sudan, including a financial statement for the year 1913.

Forest products of Canada, 1913.—Poles and cross-ties, R. G. LEWIS and W. G. H. BOYCE (*Dept. Int. Canada, Forestry Branch Bul. 47 (1914), pp. 16, figs. 2*).—A statistical account of the poles and cross-ties purchased in Canada during the calendar year 1913. In addition to the number and value, the poles and cross-ties are listed with respect to kinds of wood and chief uses, with comparative data for 1912.

Report of the fifteenth convention of the Canadian Forestry Association, held at Winnipeg, Manitoba, July 7-9, 1913 (*Rpt. Canad. Forestry Assoc., 15 (1913), pp. 118, pls. 4, figs. 19*).—This report includes the addresses and papers covering various phases of forestry as presented at the convention.

DISEASES OF PLANTS.

Plant pathology, R. E. SMITH (*California Sta. Rpt. 1914, pp. 139-142*).—The author gives an outline report of investigations in progress, dividing them into physiological plant diseases and those due to definite organisms.

Among the first class are mentioned studies on the internal brown streak of the potato, the little leaf of the cherry and other trees, exanthema or die-back of the olive and other trees, and curly top of the sugar beet. Of the diseases due to definitely known organisms, descriptions are given of the rot caused by *Armillaria mellea*, walnut blight, bean rust, pear canker, asparagus diseases, and wood decay of orchard trees, with suggestions for their prevention.

[Investigations of plant diseases], H. J. WEBBER (*California Sta. Rpt. 1914, pp. 67-72*).—A report is given outlining work in plant diseases at the Citrus Substation. Among the investigations in progress are studies of the infectiousness of the crown gall organism, lemon decay fungi, black pit of lemons, gum diseases of citrus and other fruit trees, a new disease of English walnut trees, mottling of citrus trees, fruit spots and stains, and nematode diseases.

Diseases of cultivated plants in Westphalia and their control, A. SPIECKERMANN (*Veröffentl. Landw. Kammer Prov. Westfalen, No. 17 [1914], pp. 56, figs. 17*).—This is an indexed report for the years 1910, 1911, and 1912, including a discussion of outbreaks, symptoms, causes, results, and treatments of diseases affecting various grains, tubers, roots, forage and garden plants, fruit trees with their products, etc., and giving also a tabulation of rainfall at eight stations during each month of the three years.

Report on the diseases observed at the phytopathological laboratory of the National Museum of Rio Janeiro, A. MAUBLANC (*Internat. Inst. Agr. [Rome], Mo. Bul. Agr. Intel. and Plant Diseases, 4 (1913), No. 6, pp. 858-861; abs. in Bot. Centbl., 123 (1913), No. 26, p. 672*).—The author lists, with brief discussion, some of the more important and widely extended fungi parasitic on sugar cane, cotton, grapes, rice, wheat, etc., as reported from the southern States of Brazil since the founding of the phytopathological laboratory in 1910.

The spread of the celery leaf spot disease by the use of affected seed, and its prevention, G. H. PETHYBRIDGE (*Dept. Agr. and Tech. Instr. Ireland Jour.*, 14 (1914), No. 4, pp. 687-694, pl. 1).—This is an account of investigations regarding the propagation and control of *Septoria petroselinii apii* on celery.

Tests were made with 109 samples of celery seed representing all common varieties obtained from dealers, 92 per cent of the samples showing the presence of the fungus. Tests for germinability of the spores present on the seeds showed a low rate which, however, might cause a high degree of infection when seeds are sown thickly, as is common in practice.

Tests with fungicides are described, from which it was found that infected seed are rendered safe, without serious injury to germinability, by immersion for three hours in hydrogen peroxid or formalin with or without one hour's previous soaking in water. Immersion in 2 per cent copper sulphate for 24 hours seriously impaired germinability.

Investigations on potato diseases (fifth report), G. H. PETHYBRIDGE (*Dept. Agr. and Tech. Instr. Ireland Jour.*, 14 (1914), No. 3, pp. 433-455, pls. 3; *abs. in Jour. Bd. Agr. [London]*, 21 (1914), No. 4, pp. 342-344).—Continuing previous communications (E. S. R., 29, p. 549), the author reports on several potato diseases.

As regards potato blight (*Phytophthora infestans*), it is stated that while results of spraying experiments may have been vitiated by weather conditions in 1913, spraying just before the beginning of unfavorable weather gave the best results, as in previous years. Spraying from below seemed superior to that from above. Burgundy mixture seemed on the whole superior to Bordeaux mixture, and fungicidal powders appeared to be inferior to sprays.

Stalk disease (*Sclerotinia sclerotiorum*) was best controlled by late planting, the best results being obtained from planting about May 15. Black stalk rot (*Bacillus melanogenes*) was less abundant on the hardier plants from seedlings of May and June than from those of March and April.

Regarding corky or powdery scab (*Spongospora subterranea*), it is said that among the varieties tested for several years there is not one which shows a constant tendency to resist the disease. Treatment of the soil with a mixture of ammonium sulphate and quicklime at the rate of 30 and 15 lbs., respectively, per square rod reduced the disease somewhat.

Pink rot and wilt are both claimed to be due to *P. erythroseptica*, which can attack the plant directly from the soil, possibly not through seed potatoes.

Investigations are claimed to show that a specific *Verticillium* disease of potato exists.

Potato diseases—the danger of importation, C. C. BRITTLEBANK (*Jour. Dept. Agr. Victoria*, 12 (1914), No. 7, pp. 400-403).—It is stated that the only important new disease of the potato appearing in Australia since 1911 is that known as scurf or dry scab, due to *Spondylocladium atrovirens*. Consignments of imported potatoes examined showed an abundance of disease present in most cases. One shipment, said to be fairly representative, contained *Spongospora subterranea*, *Phytophthora infestans*, *Rhizoctonia solani*, *Spondylocladium atrovirens*, *Fusarium oxysporum*, *Oospora scabies*, and *Bacillus solanacearum*.

Blotch and streak in potatoes, A. S. HORNE (*Jour. Roy. Hort. Soc. [London]*, 39 (1914), No. 3, pp. 607-614, pl. 1).—Reviewing the previous progress of investigations (E. S. R., 24, p. 247) on what it is thought may prove to be two forms of a single disease recently prevalent in the British Isles, the author describes experiments carried out at Wisley in 1912 and 1913.

It is stated that while in 1912 streak appeared in about 10 per cent of the tubers from diseased parent tubers, in 1913 no case of streak occurred. Dis-

eased crops may result from planting apparently healthy tubers, also probably sound crops from diseased tubers. Streak-free tubers descended from those on land previously showing streak in the crop gave rise to very few affected tubers in the descendants, while diseased parent tubers gave a considerable percentage of affected descendants. Planting sound tubers from land previously free from streak disease gave no typical cases of streak, but a small percentage of tubers showing some marks of internal disease. No increase or spread of the disease during the storage period could be detected, a result possibly due to care in storing.

The effect of potato scab treatments on seed vitality, T. J. MANEY (Iowa Sta. Bul. 148 (1914), pp. 39-60, figs. 13).—A summary is given of results of investigations carried on for three years to determine the effect of solutions of formaldehyde and corrosive sublimate and of formaldehyde gas treatment on the germination of potatoes.

All of the treatments were efficient in reducing the amount of scab. The author concludes that where whole tubers are treated formaldehyde at the rate of 1 pt. to 30 gal. of water or corrosive sublimate solution, 2 oz. to 16 gal. water, may be safely employed, the tubers to be soaked from 2 to 6 hours. If the tubers are left in the solution for longer periods or are not spread to dry immediately, the germination of the tubers is considerably diminished. The formaldehyde gas treatment was found to be unfavorable for use in the proportions generally recommended on account of its injurious effect on the germinating power of the tubers. The author states that seed tubers should never be cut before treatment for prevention of scab.

Sorghum smut (Agr. News [Barbados], 13 (1914), No. 324, p. 316).—This is a brief discussion of the smut of sorghum noted at Montserrat, ascribed to *Sphacelotheca (Ustilago) sorghi*, which is said to occur from time to time also on imphee and Guinea corn in the West Indies.

Infection of sorghum occurs during germination either from the soil or from adhering spores sown with the seed. The fungus first shows itself outwardly at flowering time in small masses of black powdery spores, replacing pollen and seeds. The spores are very resistant and the disease is rapidly cumulative, but the fungus does not enter the seed and is therefore accessible to fungicides. For this purpose commercial (40 per cent) formalin (1 pt. to 30 gal. water), or copper sulphate (1 lb. to 10 gal. water) are recommended. The former is used to soak the seed for two hours. The latter is employed for three minutes only, after which the seed must be quickly dried. The hot water process recommended must employ temperatures between 129 and 138° F. in order to avoid both ineffectiveness and injury to germinability.

Another smut of sorghum, *S. (U.) reiliana*, which conglomerates the whole head into a smutted mass, and which is said to require measures different from that above mentioned, is not yet certainly known to exist in the Lesser Antilles.

Black rust of Deli tobacco, J. A. HONING (Meded. Deli-Proefstat. Medan, 8 (1914), No. 4, pp. 107-111, pl. 1).—This is mainly a brief discussion of the writings of other authors on diseases caused by organisms similar or related to that described by the author (E. S. R., 31, p. 149) as causing black rust in tobacco.

Diseased tomatoes (Agr. Gaz. N. S. Wales, 25 (1914), No. 1, p. 26).—It is stated, on the authority of G. P. Darnell-Smith, that bacteria are probably the primary cause of the black spot of tomatoes, the presence of *Macrosporium tomato* being secondary. It is thought that infection is favored by the presence of the rough scars left by the fall of the styles, by irregular and intermittent water supply, by very bright sunlight, and by heavy applications of sodium nitrate. Some varieties are comparatively free from the disease.

Bordeaux mixture should be sprayed on the plants immediately after the blossoms have fallen, but such treatment is ineffective after the disease has become evident.

The oak fungus disease of fruit trees, W. T. HORNE (*Mo. Bul. Com. Hort. Cal.*, 3 (1914), No. 7, pp. 275-282, figs. 3).—The author gives an account of experiments with *Armillaria mellea* as a very common and serious disease of orchard trees in California. The fungus appears to live for a long time in soil containing roots of various wild or cultivated plants, sometimes destroying whole orchards by spreading, though slowly, from root to root and tree to tree by means of its rhizomorphs.

Cultivation of nonsusceptible plants, as alfalfa, for several years is recommended. Treatment of individual trees is said to be usually disappointing. Treatment of affected spots includes encircling ditches, also soil sterilization, for which purpose carbon bisulphid is said to offer the most promising agency so far, though care is essential to avoid overdosing. Caution is advised as regards planting infected areas with supposedly resistant trees. Fine roots are thought to be less liable to infection than larger ones.

Peach cankers and their treatment, R. A. JEHL (*New York Cornell Sta. Cir.* 26 (1914), pp. 53-64, figs. 8).—Two types of cankers, brown rot cankers and cankers caused by winter injuries, are said to be very common on peach trees. Several other types are sometimes found, but are said to be not abundant. The author describes the brown rot cankers due to *Sclerotinia fructigena* and frost cankers, giving suggestions for their control.

The treatment involves the cutting out of the infected portions of trees and coating the cut surface with gas tar as soon as the wound has dried. The gas tar is said to act as a disinfectant and preservative, and no other treatment is necessary.

Peach leaf curl fungus, G. QUINN (*Jour. Dept. Agr. So. Aust.*, 18 (1914), No. 1, pp. 32-37).—Results are given of tests carried out with *Eoascus deformans*, the cause of peach leaf curl, during 1913, also in comparison with figures previously reported (*E. S. R.*, 30, p. 50). It is stated that Burgundy mixture proved superior to all others except the standard Bordeaux mixture, also that the action of lime sulphur shows promise in this connection.

Violent outbreak of currant rust, E. NOFFRAY (*Jour. Agr. Prat.*, n. ser., 27 (1914), No. 23, pp. 722, 723).—The attack on several species of *Ribes* is described. The removal and destruction of diseased portions and plentiful employment of fungicides are prescribed.

Citrus canker, C. W. EDGERTON (*Louisiana Stas. Bul.* 150 (1914), pp. 3-10, figs. 2).—A report is given of citrus canker, a recently recognized disease that the author says is particularly serious on grapefruit and *Citrus trifoliata*, but also attacks sweet oranges and Satsumas and sometimes occurs on kumquats.

All above-ground parts of the plant are subject to the attack, the appearance of the spots varying according to the part of the host upon which they are present. The author states that the disease is known to occur in practically all the Gulf States. Its origin has not been definitely settled, although it is believed that it probably came from Japan on nursery stock, or from Brazil, where a similar disease due to *Didymella citri* was described some time ago by Noack (*E. S. R.*, 13, p. 258).

No definite means of control are known, but the author suggests the destruction of diseased material, spraying with a good fungicide, and rigid inspection of citrus stock, followed by a strict quarantine on all infected nurseries.

Pecan rosette, W. A. ORTON and F. V. RAND (*U. S. Dept. Agr., Jour. Agr. Research*, 3 (1914), No. 2, pp. 149-174, pls. 5, fig. 1).—Pecan rosette, which has been the subject of investigation for several years, is said to be generally

recognized as a serious disease. It does not appear to be limited to any particular soil type, topography, or season. The disease first makes itself evident by the tree putting out undersized, more or less crinkled and yellow mottled leaves. The axes of growth are usually shortened so that the leaves are clustered together into a sort of rosette. In well-marked cases the branches usually die back from the tip and other shoots are developed from normal or adventitious buds and in turn these pass through the same series of symptoms.

The nonparasitism of the disease seems to be rather definitely established by results obtained in isolation cultures, inoculation tests, etc. As a result of experiments in pruning, fertilizing, transplanting, etc., it is considered that the disease is directly or indirectly caused by some soil relation.

The evidence at hand appears to indicate that pecan rosette belongs among the chlorotic diseases of plants which are noninheritable and noninfectious, but due mostly to improper nutrition or injurious physical conditions.

A beech disease (*Roy. Bot. Gard. Kew. Bul. Misc. Inform.*, No. 4 (1914), p. 176).—Reference is made to a contribution by Elsie M. Prior (*E. S. R.*, 30, p. 653). The action of wind on the crown of the tree in connection with the tapering form of the trunk may, it is thought, cause cracking of the stem at a somewhat definite height as noted, giving access to *Polyporus adustus*, the fungus found in alleged causal connection with the diseased condition.

Hevea canker, I, II, A. A. L. RUTGERS (*Dept. Landb., Nijv. en Handel [Dutch East Indies], Meded. Afdeel. Plantenziekten*, Nos. 2 (1912), pp. 10, pls. 6; 4 (1913), pp. 1-7).—Continuing previous work (*E. S. R.*, 29, p. 248), it is stated that Hevea canker has appeared in Java, Sumatra, and Borneo. Its presence and progress are marked by a cessation of latex flow, claret-colored patches under the cork layers of the bark, and later an enlarging discoloration of the inner layers. This is followed by the formation of woody tissue (or wound cambium) around the dead brown cells in the inner cortex, which formation may continue even long after the infection itself is past.

Measures for eradication of the disease are those securing increased access of air and sunlight, as thinning, pruning, and removal of intercrops; preventing spread in the tissues by removal of all diseased portions of the cortex without disturbing the cambium (which requires specially trained workmen); disinfection of tapping knives by means of formalin; and preventing infection, as by spraying the stems with Bordeaux mixture.

In the second paper, the proper employment of carbolineum on first appearance of the canker is outlined and recommended. Cultural and climatic conditions and tapping as bearing upon progress and control of the disease are also discussed.

Bordeaux mixture.—I, Physico-chemical studies, O. BUTLER (*Phytopathology*, 4 (1914), No. 3, pp. 125-180, pls. 2, figs. 3).—Preliminary to an investigation of the biological properties of Bordeaux mixture, the author gives an account of studies of the physico-chemical nature of this important fungicide, in which he describes the chemistry, effect of weathering, physical properties, and methods of preparation and properties of various types of Bordeaux mixture.

Summarizing his conclusions, he states that Bordeaux mixture may be composed of one or several basic cupric sulphates or mixtures of basic cupric sulphates, depending on the ratio of cupric sulphate to calcium oxid employed. The copper precipitate of Bordeaux mixtures in which the ratio of cupric sulphate to calcium oxid is 1:1 or 1:0.5 becomes crystalline on standing when the solution contains more than 0.125 per cent of cupric sulphate. The rate of crystallization depends on the temperature and concentration of the cupric sulphate in the mixtures. The crystallization was found to be retarded by the presence of such

impurities as ferrous sulphate, calcium carbonate, magnesium oxid, and magnesium carbonate, but this retardation is not due to the diluent action of the salts in question. The crystallization may also be delayed by various inorganic salts and organic substances, saccharose being particularly effective.

Bordeaux mixtures, after carbonization, are slightly soluble in pure water and dissolve readily in water containing carbon dioxid in solution. They are also soluble in water containing ammonia salts, and alkaline Bordeaux mixtures are soluble in solutions containing dextrose, saccharose, and some other organic substances. The physical state of the copper precipitate was found to be affected, irrespective of the ratio of cupric sulphate to calcium oxid, by the dilution of the salts and the manner in which they are brought together and the temperature of the water. After the copper and lime have been brought together a slight delay in stirring the mixture was found not to affect materially the physical state of the precipitate, nor did long-continued stirring materially affect it. Three types of Bordeaux mixture are recognized, neutral Bordeaux mixtures, of which the Woburn Bordeaux mixture is a type, slightly alkaline Bordeaux mixtures, and strongly alkaline or basic mixtures.

Notes on the preparation of Bordeaux mixture, O. BUTLER (*New Hampshire Sta. Circ. 15* (1914), pp. 10, figs. 2).—This circular gives some practical deductions from the studies described above, treating principally of the nature of Bordeaux mixture, effect of method of mixing, relative value of hydrated lime and quicklime, effect of temperature on keeping quality, methods for preventing deterioration, tests for soluble copper, and descriptions of proprietary Bordeaux mixtures.

Of practical importance attention is called to the fact that hydrated lime is not to be recommended in lieu of quicklime in the preparation of this mixture except where quicklime is not obtainable or is of too poor quality to be advantageously used. The studies on temperature showed that low temperatures, 48 to 50° F., for making the mixtures and keeping them are more satisfactory than higher temperatures. In testing for excess of copper the author suggests testing for alkalinity will be usually sufficient, but he states that the 4:4:50 mixture, which is commonly used, has an excess of lime so that testing for copper would be superfluous.

The action of Bordeaux mixture on plants, B. T. P. BARKER and C. T. GIMINGHAM (*Ann. Appl. Biol.*, 1 (1914), No. 1, pp. 9-21, figs. 6).—Recent tests continuing previous work (E. S. R., 25, p. 458), made on injured and uninjured apple seedlings one year old and sprayed with Bordeaux mixture, showed that even slight fresh injuries to the leaf cuticle will permit of scorching by that fungicide; also that weather and season as well as long contact with the mixture are influential in determining susceptibility to such injurious influence.

Cells with readily permeable walls may absorb dissolved copper and be killed thereby. The nature of the cell wall is said to determine the interaction, when such occurs, between cells of higher plants and the copper compounds, some types of leaves absorbing and translocating copper without local injury. Copper may also be carried up through the roots to the aerial parts of some plants without apparent injury to the cells through which it passes.

Spreading and adherent sprays, V. VERMOREL and E. DANTONY (*Rev. Vit.*, 41 (1914), No. 1063, pp. 493, 494).—The authors, replying to questions from vine growers, give directions for the preparation and application of sprays for which, when used as prescribed, superior effectiveness with economy is claimed.

The compatibility of insecticides and fungicides, G. P. GRAY (*Mo. Bul. Com. Hort. Cal.*, 3 (1914), No. 7, pp. 265-275).—The relations of compatibility or incompatibility of various mixtures and solutions in use against insects and

fungi are shown in a tabular arrangement for convenient reference, with a key and interpretative discussion.

ECONOMIC ZOOLOGY—ENTOMOLOGY.

Game laws for 1914.—A summary of the provisions relating to seasons, export, sale, limits, and licenses, T. S. PALMER, W. F. BANCROFT, and F. L. EARNSHAW (*U. S. Dept. Agr., Farmers' Bul. 628 (1914), pp. 54, figs. 3*).—This, the fifteenth annual summary of the game laws of the United States and Canada which has been prepared on the same general plan as those previously issued (*E. S. R.*, 30, p. 52), includes the proclamation of the President and the amended regulations for the protection of migratory birds, approved October 1, 1914.

The California toad, an economic asset, T. I. STORER (*Univ. Cal. Jour. Agr.*, 2 (1914), No. 3, pp. 89–91, fig. 1).—A brief account of *Bufo halophilus*, which ranges throughout the greater part of California, being found along the coast from San Diego on the south to at least Humboldt County on the north, throughout the Sacramento and San Joaquin valleys, and well up into the Sierra Nevadas. On the hot deserts in the southeastern part of the State, in the region east of the Sierras, and to the north it is replaced by other species which differ but slightly in form or habit.

Entomology, C. W. WOODWORTH (*California Sta. Rpt. 1914, pp. 109–118, fig. 1*).—The author here reports upon the work of the year under the headings of silkworms, spraying versus bees, factors in longevity, cyanid as a soil fumigant, and insecticides.

It has previously been pointed out (*E. S. R.*, 15, p. 1091) that in the Pajaro Valley the apples that set may be wholly those from the first blossoms, that this fruit may be already as large as cherries before the larger part of the blossoms fall, and that to poison the blossom cups of the fruit the spray would have to be applied before full bloom. Thus it became necessary to determine the effect on bees of arsenical spray applied to trees just coming into full bloom. A colony was shipped from the University apiary at Berkeley to Watsonville and placed in a tree in the center of a 40-acre apple orchard just before spraying with an unusually heavy dose of arsenicals as the trees were coming into full bloom. An examination of the hive later showed no evidence of the poisoning of bees or brood. Samples of the pollen and newly stored honey were also analyzed, with negative results in the case of the latter. The hive was kept closed until a number of dead bees had accumulated, which were then analyzed and an amount of arsenic nearly approaching a toxic dose was recovered. Analyses of samples of honey gave negative results. "All clearly showed that even under the severe conditions of the excessive dose and a locality where practically all the food was from sprayed trees there was no appreciable danger to man from poisoned honey. When the more soluble arsenicals were in use there is reason to believe that many bees were killed, and even with the insoluble lead or zinc compounds now in use a small percentage evidently die of the poison."

A series of experiments was conducted by J. P. Baumberger to determine the effect on longevity of a variable temperature as contrasted with one held practically uniform. He found that when insects are exposed to an unusual temperature, either hot or cold, for two days they live longer in any other temperature than when placed directly in that temperature. "It is probable that temperature is only one of the means of so upsetting the physiological balance as to affect longevity, and that we have the suggestion of a law that may

be of highest significance to students of the action of insecticides in the interpretation of their experimental data."

The author describes experiments conducted by E. R. Ong with a view to determining the value of hydrocyanic acid gas as a soil fumigant. The method devised consists in the use of a series of tubes in the soil, through which air could be extracted and the amount of hydrocyanic acid gas quantitatively determined by the iodine test developed the previous year in the course of experiments with scale-insect eggs. The results obtained were positive and definite. Where the cyanid gas was pumped into the soil within a foot of the sampling tube, only a very small fraction of 1 per cent was recovered. The soil evidently filtered out the gas, either by absorbing or decomposing it. To determine the capacity of the soil in terms of cyanid loss, calcium chlorid tubes were then employed holding 50 cc. of soil, and gas of known strength pumped through, and it was found that before any considerable quantity of cyanid could pass the soil had taken nearly its full capacity, which was found to vary from 0.03 to 0.012 gm. per liter, or 122 to 440 lbs. of sodium cyanid per acre-foot.

"While this amount makes the cost prohibitive for large use, it is well within the possibilities for soil fumigation of small areas, and, indeed, is only a little more expensive than carbon bisulphid in clayey soils, and much cheaper in sandy soil and in any soil if the fertilizer value of the nitrogen in the material is deducted. The dose will have to be regulated by the character of the soil, since no results will be produced until after the soil has received the full amount which it can absorb or decompose."

New methods of studying the action of cyanid gas on scale-insect eggs are said to have been employed with very satisfactory results, data having been obtained on about 30,000 layings. The methods employed are briefly described.

Report of the entomologist, H. T. FERNALD (*Massachusetts Sta. Rpt. 1913, pt. 1, pp. 55a-58a*).—During the year the box leaf miner (*Monarthropalpus buxi*), a recently imported insect, caused much injury to box trees and hedges. It is pointed out that during the year over 90 per cent of the San José scales examined were parasitized by a species, previously described by Tower as *Prospaltella perniciosi* (E. S. R., 29, p. 459). This parasite is said to have been reported from Connecticut, New York, and Pennsylvania, and has been sent to a number of other States for colonization.

Insects injurious to stored raisins, F. T. BIOLETTI (*California Sta. Rpt. 1914, pp. 189, 190*).—It is stated that much injury is caused to raisins by insects, the Indian meal or raisin moth (*Plodia interpunctella*) and the saw-toothed grain beetle (*Silvanus surinamensis*) being the principal pests concerned. Since the methods of control by screening and fumigation have proved ineffective in many cases an investigation was undertaken, and it was found that slight changes in the methods in use would insure protection. It is pointed out that the fumigating rooms should be very carefully constructed to prevent the escape of the gas, and should preferably be built of concrete. It is important that improvements in screening and trapping devices be made and the insects, usually allowed to escape when the raisins are passed through the sizing and screening machines, be caught and destroyed.

A study of the life history of the raisin moth indicates that their numbers can be considerably reduced by carefully regulating the time of storage of the raisins in the vineyard and packing house.

The parasitism of insects by the Entomophthoræ, F. PICARD (*Bul. Soc. Etudes et Vulg. Zool. Agr., 13 (1914), Nos. 1, pp. 1-7; 2, pp. 25-30, pls. 2; 3, pp. 37-40, pl. 1; 4, pp. 62-65*).—This is a comprehensive review of the subject, with references to the literature.

Hosts of insect egg parasites in Europe, Asia, Africa, and Australasia, with a supplementary American list, A. A. GIRAULT (*Ztschr. Wiss. Insektenbiol.*, 10 (1914), Nos. 3, pp. 87-91; 4, pp. 135-139; 5, pp. 175-178; 6-7, pp. 238-240).—This list is arranged on the same plan as that for North and South America, previously noted (E. S. R., 25, p. 852).

Some factors affecting results in the use of high temperature for the control of insects injuring cereal products, W. H. GOODWIN (*Jour. Econ. Ent.*, 7 (1914), No. 4, pp. 313-322).—The author reports upon experiments conducted with 13 different pests which show that moisture is a very important factor when using high temperatures for the control of insects affecting cereals and cereal products. He concludes that the practical value of high temperature at 48 to 50° C. for the destruction of pests affecting such products is much lessened when the heated atmosphere contains moisture greater than 40 to 50 per cent. Oven experiments demonstrate that 50 to 55° kills all stages of cereal insect pests if they are actually subjected to this temperature for one to two hours. "In practical work, moisture conditions are extremely important and must not be overlooked, as failure to obtain the necessary temperature is often due to lack of sufficient radiating surface to overcome the excessive moisture conditions. Because of the more rapid radiation obtained, the use of steam at 50 to 60 lbs. pressure will give results superior to those gotten with 8 lbs. pressure with one-fourth more of radiating surface."

The destruction of underground pests, E. MOLINAS (*Prog. Agr. et Vit. (Ed. l'Est-Centre)*, 35 (1914), No. 12, pp. 374-378; *abs. in Rev. Appl. Ent.*, 2 (1914), Ser. A, No. 6, pp. 362, 363).—The author calls attention to the work of Dumas and others with potassium sulphocarbonate as an insecticide. Through the action of the carbonic acid contained in the air and in water, potassium sulphocarbonate, which is produced commercially in the form of a dark red solution containing 14 to 16 per cent sulphid and 18 to 20 per cent of potash, slowly decomposes and resolves itself into carbon bisulphid and sulphureted hydrogen, both of which gases are insecticides, and a residue, potassium carbonate, which can be used as a fertilizer. Potassium sulphocarbonate is said to have an advantage over carbon bisulphid in that it acts more slowly and for a longer time, and that it entirely impregnates the mass of soil. One part of the commercial solution diluted in 100 parts of water, both by volume, and the liquid poured from a watering can in such quantity as to insure adequate penetration kills slugs, cutworms, earthworms, white grubs, longicorn larvæ, and millipedes.

Tulips and carnations are not affected by a 1 per cent solution, and even 2 per cent may be used. Only when a 5 per cent solution is employed do carnations begin to suffer. The cost of potassium carbonate solution is not very high and its manurial value may also be deducted. See also the work by Bourcart, previously noted (E. S. R., 29, p. 341).

Soil fumigation, J. A. HYSLOP (*Jour. Econ. Ent.*, 7 (1914), No. 4, pp. 305-312).—This discussion relates to soil fumigation work conducted by the Bureau of Entomology of this Department during the season of 1913. It is claimed that the work has shown (1) that sodium cyanid will not permanently injure the soil; (2) that it can not be applied while crops are on the land nor immediately prior to seeding; and (3) that it will kill wireworms.

The food of the earwig (*Forficula auricularia*) as shown by the contents of its crop, G. LÜSTNER (*Centbl. Bakt. [etc.]*, 2. Abt., 40 (1914), No. 19-21, pp. 482-514; *abs. in Rev. Appl. Ent.*, 2 (1914), Ser. A, No. 9, pp. 546, 547).—The author summarizes the literature on the subject and reports upon examinations made of crop contents.

Examination of several lots, comprising 162 earwigs, have led to the conclusion that they are omnivorous feeders. Normally they feed on dead plants and

on fungi such as *Capnodium*, but when favorable opportunity occurs, living leaves and flowers are attacked. While the author states that only dead animal matter appears to be consumed, a footnote in the abstract calls attention to the fact that earwigs consume living insects, such as *Depressaria* pupæ, as well.

Forficula auricularia in Rhode Island, R. W. GLASER (*Psyche*, 21 (1914), No. 5, pp. 157, 158).—The author reports that in July, 1914, this European earwig was the source of considerable annoyance on an estate at Newport, R. I., through entering the house and crawling over the inhabitants at night. The species was first observed in 1912. In 1913 they had increased to such an extent that suppression by spraying was begun, and by July, 1914, they seemed to have passed beyond control and had spread to adjoining estates. The species is supposed to have been introduced through the agency of imported plants.

The green soldier bug (*Nezara hilaris*), R. D. WHITMARSH (*Jour. Econ. Ent.*, 7 (1914), No. 4, pp. 336-339).—Severe loss was sustained by peach growers along the Marblehead peninsula region of Lake Erie during 1911 as a result of injuries caused by *N. hilaris*, which commences its feeding on the small fruit during the last part of June and early July and continues working upon the fruit until late fall. Where the fruit is badly punctured it becomes unsalable, while the extra fine fruit showing but one or two punctures has to be graded lower, thus decreasing its value.

Practically no damage was done during 1912. In 1913 it occurred in small numbers on peaches in the previously infested district along Lake Erie, but the damage done was slight as compared with that of 1911.

Mr. Crawford's recent work on the Delphacinae, E. P. VAN DUZEE (*Psyche*, 21 (1914), No. 5, pp. 163-166).—A discussion of the work previously noted (E. S. R., 31, p. 550).

Papers on Aphididae.—The yellow clover-aphis (*Callipterus trifolii*), J. J. DAVIS (*U. S. Dept. Agr., Bur. Ent. Bul.* 25, pt. 2, tech. ser. (1914), pp. 17-40, pl. 1, figs. 6).—The yellow clover-aphis (*C. trifolii* seu *ononidis* [*Chaitophorus maculatus*]), originally described by Monell from Washington, D. C., is common and oftentimes abundant throughout the eastern half of the United States, except possibly in the extreme southern portions, although it has never been considered a pest in this country, and consequently little of its life history and habits has been studied.

In Asia the species was first reported from Jodhpur, India, by Buckton in 1889, and the author has received specimens presumably collected at Lahore, India. In America red clover (*Trifolium pratense*) is the universal food plant of this species, it usually being found on the underside of the leaves, living more or less solitary. It has also been reared from white clover (*T. repens*). Tests made of various plants show that this species can also breed without difficulty on alsike, English, and mammoth clovers. In India the species lives on alfalfa, and Buckton has received reports that it is destructive to this plant, but it has not been found to attack alfalfa in this country. Why this species lives on *Trifolium* but not on alfalfa in America while in India it is found on alfalfa but apparently not on *Trifolium* remains to be explained.

Descriptions are presented of the wingless stem mother, winged viviparous female, wingless viviparous female, winged male, and wingless oviparous female. "With *C. trifolii*, as with most other plant lice, a number of generations of winged and wingless viviparous females are produced during the summer, and the true sexes, consisting of winged males and wingless oviparous females, appear in the fall; these females in turn laying eggs on the stems and leaves of clover to carry the species over the winter months. This species does not have an alternate host, nor does it ever pass the winter, in the latitude of La Fayette, Ind., as viviparous females." The author is of the opinion that in

the Southern States, however, it probably does winter as viviparous females, since viviparous forms are not uncommon at Clemson College, S. C., in December, whereas a careful search for sexual individuals proved fruitless. "As is characteristic of this tribe of plant lice (Callipterini), the species under discussion is sporadic in habit and is very easily roused, the least disturbance causing it to jump from its host. This habit is much to its advantage, for it seems to render the species almost immune from predaceous and parasitic enemies."

In generation studies at La Fayette, Ind., in 1913, the details of which are reported in tabular form, the author has found the maximum number to be 17 and the minimum 8; thus $12\frac{1}{2}$ is the approximate average number of generations. The first generation extended over a period of 39 days, from April 22 to May 31; the second, 60 days; the third, 54 days, etc.; and the eighth generation, which includes the last generation of the last-born series, being the longest, extending over a period of 128 days. Studies by Phillips and Parks of the line of generations of *C. trifolii* from May 13, 1909, to oviparous generation, at La Fayette, Ind., are also presented in tabular form. Observations indicate that this species invariably molts but four times.

Weather conditions, especially heavy rains, are thought to be the most important checks of the yellow clover-aphis. The aphis fungus, *Empusa aphidis*, is likewise quite an important factor in holding this plant louse in check. On account of its habits of living singly and jumping from the leaf at the least disturbance, this species is seldom attacked by internal parasites. Three species of coccinellids, namely, *Megilla maculata*, *Hippodamia convergens*, and *Coccinella 9-notata*, have been reared from larvæ found feeding on *C. trifolii*.

A bibliography of 14 titles is appended.

The conquest of verruga, C. H. T. TOWNSEND (*Peru To-day*, 6 (1914), No. 2, pp. 57-67, figs. 20).—This is a brief statement of the results of investigations relating to the transmission of verruga by biting flies (*Phlebotomus verrucarum*), carried on under the direction of the author from February 22, 1913, to June, 1914, accounts relating to which have been previously noted (E. S. R., 29, p. 856; 30, pp. 252, 658; 31, p. 847).

The author believes it to be possible to remove entirely the *Phlebotomus* from the vicinity of any given habitation or house in the verruga zone, by simply clearing away all stone walls and rock piles within a radius of several hundred yards and doing away with any caves or cavities in the rock that may be located within that radius.

Contribution to the knowledge of the biology of *Bibio hortulanus* and its control, E. MOLZ and W. PIETSCH (*Ztschr. Wiss. Insektenbiol.*, 10 (1914), Nos. 3, pp. 98-105; 4, pp. 121-125; abs. in *Internat. Inst. Agr. [Rome]*, Mo. Bul. Agr. Intel. and Plant Diseases, 5 (1914), No. 7, pp. 966, 967).—An outbreak of *B. hortulanus* occurred in the Province of Saxony in 1913 and in addition to sugar beets, the only crop which it had previously been known to injure, it attacked spring barley and wheat so severely that many fields had to be plowed up and resown. The damage is caused by the larvæ, which feed until the beginning of May and then pupate at from 2 to 4 in. below the surface of the soil.

In investigations conducted by the author it was found that contact poisons had very little effect. The most satisfactory control measures consist in plowing deeply and rolling at the time of pupation.

The apple root borer, F. E. BROOKS (*U. S. Dept. Agr., Jour. Agr. Research*, 3 (1914), No. 2, pp. 179-188, pls. 3).—During the course of investigations of the roundheaded apple-tree borer (*Saperda candida*) carried on by the author in West Virginia in 1911, numerous associated burrows of a smaller insect were observed which later were found to be those of *Agilus vittaticollis*, a beetle which hitherto had not been recognized as an enemy of cultivated fruit trees,

and to which the name apple root borer is given. Further observations have shown that the species is quite generally distributed throughout the Appalachian fruit region and that in places it is doing considerable damage to young apple trees. A study of the literature has shown that this species was first described from Massachusetts in 1837 and was reported in 1875, as having been found living on the service tree or shadbush (*Amelanchier canadensis*) in various parts of that State. It was reported in 1889 as being found occasionally in Massachusetts in June feeding on the leaves of thorn, service tree, and chokeberry. A specimen in the National Museum is recorded as having been collected at Tryon, N. C., in June on leaves of *Oxydendrum*. Since the species is also recorded from Michigan, Pennsylvania, and New Jersey, it is thought probable that it occurs throughout the greater part of the eastern United States.

The injury to the trees is done by the slender, white larva which bores through the sapwood and heartwood of the roots and lower trunk, the burrows through the roots frequently extending outward for several feet and in badly infested trees being so numerous that the roots often die, causing a weakness of the whole tree. The work of the insect is obscure, there being no chips or castings coming to the surface as is the case with the roundheaded apple tree borer. The egg, which is placed rather conspicuously on the bark of the trunk, and the exit holes through which the adult escapes from the wood are the only external marks made by the insect on the tree. In addition to the injury resulting from the damaged roots, the exit holes in the bark admit more or less water, which frequently induces decay of the heartwood. At French Creek, W. Va., 125 apple, 20 pear, and 200 service trees from one-half to 5 in. in diameter were cut off a few inches above the ground and, upon examination, showed 311, 9, and 342 burrows of *Agrilus* and 101, 0, and 21 burrows of *Saperda*, respectively. The author reports having found the larva to attack apples, pear, wild thorn, wild crab, and service tree. Of the several larval food plants named the apple and service tree seem to be greatly preferred.

In the latitude of West Virginia the eggs are deposited in May and June. They are glued tightly to the bark of the trunk a few inches above the ground singly or, rarely, in pairs. On hatching out the larva leaves the egg from the underside, bores directly through the bark to the cambium, and thence through the cambium down the trunk to the ground, whence it proceeds onward through a convenient root. After boring through the cambium for a distance of from 6 to 12 in. it burrows abruptly into the solid wood, where all the feeding throughout the remaining part of the larval stage is done. After burrowing into the solid wood of the root the larva continues to feed outward from the tree. If the root is long enough the burrow may continue toward the tip for a distance of 3 or 4 ft., after which it turns and is directed back toward the base. It spends its first winter well out from the trunk, often in a root not more than one-sixteenth of an inch in diameter. It is active late in the fall and early in the spring, and it is thought probable that considerable feeding is done during the winter. "With the coming of warm weather it feeds rapidly back toward the base of the root, and by midsummer it has reached the center of the root system and has begun to ascend the body of the tree. The latter part of the summer and the fall are spent in boring upward through the trunk and in fashioning a pupal chamber. In trees that are quite small pupation takes places within 5 to 10 in. of the ground, but in larger trees the larvæ for some reason ascend higher before forming the pupal cells. In apple and pear trees that are as large as 6 in. in diameter at the base of the trunk it is not unusual for the larvæ to ascend 2 or 3 ft. to pupate, and in one case an individual was found in a 12-year-old pear tree that had burrowed up from the

roots and pupated in a branch 46 in. above the ground. The ascent through the trunk is usually made within half an inch of the inner bark, the larva occasionally approaching the bark but never entering it." In December of the second year the larva gets permanently settled in its cell and pupation takes place with the coming of the first few warm days of spring. The pupal stage lasts from three to four weeks and the adults emerge in May. It is probable that the life of the adult does not often exceed two or three weeks.

Mention is made of the habits of other members of the genus *Agrilus*, several of which are well-known pests. As regards natural enemies, the author reports the discovery of one hymenopterous parasite which attacks and destroys the larva and pupa, and which has been described by Viereck as *Xylophruridea agrilli* n. g., and n. sp. (E. S. R., 29, p. 563). Two generations of this parasite occur annually, one brood of the adult appearing early in the spring and the other late in the fall. From 25 to 40 per cent of the root borers are said to be destroyed by this enemy. It is pointed out that control measures must be directed toward the protection of the trunk of the tree against the deposition of the egg rather than the killing of the borer after it begins feeding. "Where paints, washes, or mechanical devices of any kind are used on trees as a preventive of injury by the roundheaded apple tree borer, equal protection may be had against the apple root borer by treating the trunks at about the time fruit is setting in the spring. The egg-laying season is of short duration, and temporary wrappers of paper or burlap, or any other material that will entirely cover the lower 2 ft. of the trunk for a period of four or five weeks following the blooming season of the apple, will in a large measure prevent eggs from being placed on the bark. Treatment with sticky adhesive or heavy paints that are not injurious to the trees will answer the same purpose." Since the apple root borers develop freely in the common service tree, the proximity of apple orchards to woods in which this tree flourishes may always be regarded as a source of possible infestation.

The western corn rootworm, G. G. AINSLIE (*Jour. Econ. Ent.*, 7 (1914), No. 4, pp. 322-324).—The data here presented supplement an account by Webster, previously noted (E. S. R., 30, p. 56).

The author has almost completely worked out the life and seasonal histories of the species in Tennessee and found them to be substantially the same as farther north. It is stated that on river bottom land in Tennessee which was under water eleven times in one winter, each time for from two to twelve days, the larvæ were as numerous the following summer as elsewhere.

The carpet beetle or "buffalo moth," L. O. HOWARD (*U. S. Dept. Agr., Farmers' Bul.* 626 (1914), pp. 4, fig. 1).—This popular account of *Anthrenus scrophulariæ* is a reprint of Bureau of Entomology Circular 5, revised.

The postembryonal stages of *Otiorhynchus cribricollis* with parthenogenetic reproduction at irregular intervals, G. GRANDI (*Bol. Lab. Zool. Gen. e Agr. R. Scuola Sup. Agr. Portici*, 7 (1913), pp. 72-90, figs. 12; *abs. in Rev. Appl. Ent.*, 2 (1914), Ser. A, No. 3, p. 181).—Both the larva and adult of *O. cribricollis* are a source of injury to alfalfa in the vicinity of Portici, Italy. It is stated that in addition to *O. cribricollis*, the biology of which is here dealt with, two other species, namely, *O. turca* and *O. ligustici*, are known to reproduce parthenogenetically. A bibliography of 22 titles is included.

The codling moth in Iowa (*Carpocapsa pomonella*), R. L. WEBSTER (*Iowa Sta. Bul.* 147 (1914), pp. 5-35, figs. 17; *popular ed.* (1914), pp. 8, figs. 5).—The author estimates the annual damage to the apple crop in the State of Iowa by the codling moth to amount to approximately \$3,000,000. Studies of its life history have shown that there are two distinct generations each year in Iowa,

the larvæ of the first generation entering the fruit early in June; those of the second late in July and early in August.

Details are presented of spraying experiments conducted at Ames. It was found that where the infestation was not severe the larvæ were kept well under control by two sprayings ten days apart with lead arsenate after the blossoms fell. Of these two sprays the first alone did almost as well as the two combined where the infestation was not severe, but under badly infested conditions these two sprays did not keep the worms in check, and in Iowa orchards where the infestation is severe it will be necessary to spray during the summer. "In order to catch the first of the second brood worms spraying must be done in July. In southern Iowa it should be finished by mid July, in central Iowa by July 20, in northern Iowa by July 25. These dates are approximate.

"To keep down the codling moth, spray thoroughly immediately after the blossoms fall, then if wormy apples are found in July spray again for the second brood."

A destructive pine moth introduced from Europe (*Evetria buoliana*), A. BUSCK (*Jour. Econ. Ent.*, 7 (1914), No. 4, pp. 340, 341, pl. 1).—A lepidopteran that was reported in May, 1914, to be seriously injuring young Scotch pines at Great Neck, L. I., has been reared and identified by the author as *E. buoliana*, a species recognized by the leading foresters of Europe as one of the most or even the most injurious of the insect enemies of *Pinus sylvestris* and other pines. The larvæ tunnel in the tips of the leading branches and thereby check the early growth and injure the appearance of the trees. A peculiar curved growth, the so-called "Posthörn," or "Baionnette," a familiar sight in European pine forests, which seriously depreciates the value of the trees, is a characteristic result of the injury.

An investigation made by the author leads him to conclude that the pest is a recent introduction.

Red spider control, E. A. MCGREGOR (*Jour. Econ. Ent.*, 7 (1914), No. 4, pp. 324-336).—The data here presented supplement the account previously noted (*E. S. R.*, 29, p. 360). The author states it appears to be established that in South Carolina the great bulk of continuous dispersion of the red spider on cotton is effected by means of travel from plant to plant across interlacing branches. Experiments have shown that nine hours of complete submergence is necessary to insure the death of the red spider by water.

Tick eradication in Arkansas, R. M. GOW (*Arkansas Sta. Bul.* 119 (1914), pp. 3-20, figs. 8).—This bulletin presents a brief discussion of the importance of eradication of the tick, its life history and habits, and methods of combating it, including specifications and plans for the construction of a concrete dipping vat.

As a result of the work fifteen counties in the State have been released from federal quarantine and portions of several others. The total area released is 12,668 square miles, or nearly one-fourth of the entire State. The estimated number of cattle in the released area is 217,000. It is stated that a general interest in tick eradication is now being shown all over the State. During the winter months concrete dipping vats have been built in three-fourths of the counties in the State, some by individuals and others by several farmers working together.

FOODS—HUMAN NUTRITION.

[The importance of sea food in the diet], J. C. LINTHICUM (*Cong. Rec.*, 51 (1914), No. 132, pp. 9561-9564).—In emphasizing the need for conservation and development of marine sea-food life, the author considers somewhat at length the importance of fish as food.

The water content of oysters, F. L. SHANNON (*Proc. Assoc. Amer. Dairy, Food and Drug Officials*, 17 (1913), pp. 161-165).—The author reports the results of a study of the water content of ten samples of oysters marketed in sealed cans, undertaken with special reference to the determination of a market standard for oysters. The paper is followed by a discussion.

The water content of meat products, E. FEDER (*Chem. Ztg.*, 38 (1914), No. 67, pp. 709-711).—From the large amount of analytical data here presented, the author draws the general conclusion that there is a definite relationship between the water content of meat and the amount of organic nonfatty material. The water content appears to be approximately equal to four times the amount of organic nonfatty material.

Studies of the bacteriology of sausage and similar goods, E. SACQUEPÉE and P. LOYGUE (*Compt. Rend. Soc. Biol. [Paris]*, 76 (1914), No. 17, pp. 820-822).—The studies reported had to do with the occurrence of proteus and paratyphoid bacilli.

Eggs, W. S. MATTHEWS (*Ill. State Food Com. Bul.* 30 (1914), pp. 4).—Recommendations as to how the egg supply may be improved are given for the benefit of the farmer, the buyer, the baker, the retailer, and the housewife.

[Composition of] cassava, J. S. CAMUS (*Philippine Agr. and Forester*, 3 (1914), No. 4, p. 75).—Analytical data are presented and discussed.

Rice (*Oryza sativa*) (*Food and Drugs, n. ser.*, 2 (1914), No. 3, pp. 145-155, figs. 3).—In addition to describing some of the more common varieties of rice grown in India, this article contains a summary and digest of data regarding the chemical composition of the raw and cooked product and the dietetics of rice.

[Wheat and flour investigations], R. HARCOURT (*Ann. Rpt. Ontario Agr. Col. and Expt. Farm*, 39 (1913), pp. 24, 25).—The results are reported of analyses and baking tests of several samples of wheat.

The baking quality of German wheats, G. CORDUAN (*Illus. Landw. Ztg.*, 33 (1913), No. 101, pp. 917, 918).—The composition and baking quality of flours from rye and wheat grown in foreign countries were studied in comparison with flour from German grains grown upon plats which had been intensively fertilized. The experiments tended to show that although with the use of fertilizer the protein value increased, the ash and fat content remained constant, and the amount of carbohydrates decreased, no constant and definite relationship existed. No apparent difference was noted, for example, in the baking qualities, in the yield of dough, and in the weight and volume of the loaf.

Study of some Italian hard wheat flours, L. MAURANTONIO (*Staz. Sper. Agr. Ital.*, 47 (1914), No. 3, pp. 217-230).—Analytical data are presented and discussed regarding a number of samples of flour from hard wheat grown in the district of Bari.

Diminished gluten content of flour, BALLAND (*Ann. Falsif.*, 7 (1914), No. 69, pp. 381-383).—Some fluctuations were noted, but on the whole there has been a decline in the gluten content of French wheats, the average value in 1869 being 28.4 and in 1914 24.23 per cent.

The bread-making industry at Milan (*Jour. Roy. Soc. Arts*, 62 (1914), No. 3222, pp. 841, 842).—A brief survey is given of the bread-making industry with special reference to the introduction of improved methods, the sanitary condition of the bakeries, and the wages of the employees.

Use of dried potatoes in bread making (*Landw. Wchnbl. Schles. Holst.*, 64 (1914), No. 35, pp. 851, 852).—By a modern milling process dried potatoes yield a flour of good keeping quality. It is stated that in making different kinds of bread as high as 40 per cent of this flour can be used to good advantage.

A program for dehydrated vegetables, H. J. BURGESS (*Pure Products*, 10 (1914), No. 8, p. 399).—The nature, marketing, and use of dehydrated vegetables and similar topics are discussed.

Use of green vegetables in the farm home (*Landw. Wchbl. Schles. Holst.*, 64 (1914), No. 35, pp. 852-854).—The use of green vegetables like peas, beans, asparagus, cauliflower, etc., is discussed briefly and directions given for their preparation.

The banana fruit, J. DACANAY (*Philippine Agr. and Forester*, 3 (1914), No. 4, pp. 81-83).—Data are presented regarding the chemical composition and culinary properties of bananas. Some recipes are also given.

Ice cream experiments (*Ann. Rpt. Ontario Agr. Col. and Expt. Farm*, 39 (1913), pp. 92-94).—In the investigation here reported studies were made of the factors which cause "swell" or "overrun," and the percentage of "over-run" which is possible with good results.

Studies were also made of the factors causing smoothness or lack of smoothness, the factors favorable to and necessary for producing a good shipping product, and the profits of ice cream manufacture as compared with selling the cream for consumption as such or for the manufacture of butter.

Ice cream, W. S. MATTHEWS (*Ill. State Food Com. Bul.* 28 (1914), pp. 16, fig. 1).—This bulletin, which is intended for the use of persons engaged in the manufacture and sale of ice cream, contains data regarding the state food laws, as well as information relative to the purchase of raw materials, and the construction, lighting, ventilating, and general sanitary condition of ice cream factories.

Confectionery, A. MCGILL (*Lab. Inland Rev. Dept. Canada Bul.* 288 (1914), pp. 21).—The results are reported of the analysis of 174 samples of confectionery purchased throughout the Dominion of Canada. These were especially examined for the presence of arsenic which might enter into their composition either through coloring matter or glucose. In no case was arsenic found beyond such minute traces as were regarded as entirely harmless.

Candy making in the home, CHRISTINE T. HERRICK (*Chicago and New York*, 1914, pp. 130).—This book contains a large number of recipes.

Canning, preserving, and pickling, MARION H. NEIL (*Philadelphia*, 1914, pp. 284, figs. 12).—A large number of recipes for homemade preserves, pickles, catsups, etc.

Preserving and canning, EMILY RIESENBERG (*Chicago and New York*, 1914, pp. 104).—Directions are given for the canning of fruits and vegetables, together with recipes for the preparation of jams, preserves, jellies, marmalades, pickles, and beverages.

Ground ginger and a study of analytical results, A. MCGILL (*Lab. Inland Rev. Dept. Canada Bul.* 286 (1914), pp. 35).—Analytical data are given concerning 259 samples of ground ginger as sold in Canada, of which 194 were found to be genuine. Attention is called to the practice of the adulteration of this spice with exhausted ginger, which is difficult to detect.

An examination of catsups, C. E. GABEL (*Amer. Food Jour.*, 9 (1914), No. 9, pp. 561-564, fig. 1).—In this article directions are given in detail for the examination of catsups for yeasts, molds, and bacteria, together with a discussion of the necessity for microscopical examination of catsups and of the methods most commonly used.

Safe ice, H. S. CUMMING (*Pub. Health Rpts. [U. S.]*, 29 (1914), No. 32, pp. 2066-2074).—It is pointed out that both natural and artificial ice may be formed from water containing infectious pollution. It is concluded that clear

ice is of itself as free from the danger of conveying infectious diseases as is necessary, but that dirty or cloudy ice may be dangerous. "We may eliminate all danger by avoiding the handling of ice with dirty hands, by washing the ice with pure water, and by using only clear ice."

Federal Food and Drugs Act and decisions, compiled by C. A. GWINN (*Washington: U. S. Dept. Agr., Office Solicitor, 1914, pp. 857*).—In addition to the text of the statutes are included the following: Rules and regulations for the enforcement of the acts; a compilation of food-inspection decisions; selected court decisions which involve an opinion or charge to the jury; a digest of decisions; and opinions of the Attorney General. An appendix also gives a legislative history of the food and drugs act and the amendments of August 23, 1912, and March 3, 1913, and the report of the Solicitor General to the President and the decision of the President regarding the labeling of whisky.

General [food, drug, and health laws] (*Topeka, Kans., 1913, pp. 115, figs. 17*).—A compilation of the state laws and regulations of the state board of health, with which are incorporated a number of rules and suggestions for health officers.

[Food and drug inspection and analysis], H. E. BARNARD (*Ann. Rpt. Ind. Bd. Health, 31 (1912), pp. 393-547*).—The work carried on during the year ended October 1, 1912, is reviewed. It included the examination of 2,050 samples of miscellaneous food products, of which 546 were found to be illegal. This is an improvement over preceding years.

The results are also given of the examination of 399 samples of drugs, of which 142 were found to be illegal.

Inspections were made of a large number of dairies, creameries, and establishments where foods were manufactured or sold. A study of the daily soot deposit in the city of Indianapolis is also reported.

[Inspection of creameries, dairies, and ice cream factories], G. W. McGUIRE (*Ann. Rpt. Bd. Health N. J., 37 (1913), pp. 205-227*).—In addition to general data regarding routine inspection, attention is called to a number of existing conditions, among which is the frequent imperfect washing of utensils, glasses, and dishes in which ice cream is served. Since heavy sirups and ice cream very readily adhere to containers in which they are served, and can not be thoroughly removed without the use of hot water and soap, it is deemed essential that all places dispensing ice cream should be equipped with proper washing facilities and a sufficient supply of hot water.

The question of a fixed standard for ice cream is also discussed.

Notes on meat inspection, oyster culture, food preparation, etc., in Holland, W. J. HOWARTH (*Jour. Roy. Sanit. Inst., 35 (1914), No. 6, pp. 254-262*).—A summary of data.

Cooperative public health administration—an experiment in small communities, E. B. PHELPS (*Pub. Health Rpts. [U. S.], 29 (1914), No. 39, pp. 2477-2526, figs. 3*).—The results are reported in considerable detail of an experiment in which was studied the possibility of a number of small towns securing proper health administration through cooperation. Such cooperative work offers an important means of securing, among other things, an efficient milk, food, and general sanitary inspection.

Institutional supplies (*Rpt. [Md.] Bur. State and Munic. Research, No. 5 (1913), pp. 66*).—This publication, which was prepared for the guidance of purchasing officials in Maryland institutions, consists of three parts, a general discussion, notes for the use of purchasing officials, and specifications.

Report upon the high cost of living of the committee of forty of the city-wide congress, A. R. L. DOHME (*Baltimore, Md. [1912], pp. 15*).—According to the conclusions reached, the facts, briefly summarized, which have increased

the cost of foodstuffs, are as follows: "Increased supply of gold; tariff upon foodstuffs and other products; price control by exchanges and agreements; abuse of cold storage to help corner markets; decreased amount of labor on farms and consequent increase in wages; decrease of truck farms and farming around the city; excessive profits by middlemen, due to too many small shops, and too much handling between producer and consumer; too much purchase on credit at advanced prices; inadequate transportation to proximate farming districts, especially in winter; bad roads and inadequate repair of same; short weights and inadequate control of scales, measures, and weights; abuse of patent laws; architects making no provision in modern houses for storage of goods; growing luxuriousness of the people, which eliminates careful and businesslike housekeeping and shopping; telephones, resulting in ordering on credit without bargaining for price; and inadequacy of facilities, too high charges, and improper conditions of our city markets."

Legislative and other remedies are suggested, including measures designed especially to remedy local conditions. Among others may be mentioned the suggestion "that schools for teaching farming in a businesslike way be established in connection with our public school system; . . . that our markets be so reconstructed as to be sanitary throughout and kept so at all times, amply supplied with running water, comfort stations, and cold storage plant; and so arranged that farmers, butchers, fish dealers, provision dealers, etc., have separate sections, and that the stalls be leased under annual contract at a nominal charge sufficient only to cover cost of maintenance of cold storage plant and employees necessary to manage the market; . . . and that a Farm Products Company be formed by capitalists and interested householders on the cooperative plan, which shall buy up or lease land for truck gardening contiguous to the city, and manage it in a businesslike way from a central office employing the most approved business methods of management and most approved scientific methods of farming, fertilizing, etc."

Low cost recipes, compiled by EDITH G. HARBISON (*Philadelphia, 1914, pp. 208*).—A large number of recipes are given.

Education in food values (*Chambers's Jour. [London and Edinb.], 7. ser., pt. 40 (1914), pp. 268, 269*).—A discussion of the nutrition investigations of the United States Department of Agriculture, and their results.

The hygiene of the preparation, storage, and distribution of food, J. CATES (*Jour. Roy. Sanit. Inst., 35 (1914), No. 6, pp. 237-247*).—A digest of data. The paper is followed by a discussion.

The cause and prevention of pellagra, J. GOLDBERGER (*Pub. Health Rpts. [U. S.], 29 (1914), No. 37, pp. 2354-2357*).—In an investigation of pellagra in a number of institutions it was noted that in the diet of those developing pellagra there was "a disproportionately small amount of meat or other animal protein food, and consequently the vegetable food component, in which corn and sirup were prominent and legumes relatively inconspicuous elements, forms a disproportionately large part of the ration."

The inference is drawn that pellagra is not an infection but a disease essentially of dietary origin and is probably caused either by the absence from the diet of some essential substance, or vitamins, or possibly by the presence of some excessive amounts of a poison in the vegetable part of the diet.

The treatment of pellagra, W. F. LORENZ (*Pub. Health Rpts. [U. S.], 29 (1914), No. 37, pp. 2357-2360*).—Improvement was noted in the majority of 27 acute cases of the disease, in which practically the only treatment given was rest in bed and a generous diet consisting chiefly of fresh meat, eggs, wheat bread, fresh vegetables, and milk.

A nutritional index for school children, A. W. TUXFORD (*Pub. Health [London]*, 27 (1914), No. 11, pp. 377, 378).—This article discusses a nutritional index calculated from the body weight and height, which is designed for use in comparing children in different locations as to their general nutritional condition.

Studies of the influence of diet upon growth, H. ARON (*Berlin. Klin. Wehnschr.*, 51 (1914), No. 21, pp. 972-977, figs. 10).—A digest of data in which the work of others is reviewed as well as previous work by the author which has already been noted (E. S. R., 30, p. 365).

Study of the effect of different foods upon the secretion of digestive ferments, O. WOLFSBERG (*Hoppe-Seyler's Ztschr. Physiol. Chem.*, 91 (1914), No. 5, pp. 344-371, fig. 1).—Some experiments were carried out with dogs, in which a large number of different foods were employed. The following conclusions are drawn:

In the case of meat, bouillon, and milk, secretion was found to be proportional to the amount of food, while with vegetables, bread, butter, and sugar, no great increase in secretion was noted even when the quantity of these foods was doubled. Extractives produced increased secretion, due to stimulation of the hormones of the membrane of the pylorus. This stimulation was believed to be of chemical nature and was possible only when the extractives remained for some time in the stomach. Under similar conditions with the same food the amount of secretion was approximately constant. Even with a twofold secretion the time of emptying the stomach was not doubled and often this time was not changed.

Experimental studies of the metabolism of nucleosids, guanosin, and adenosin, I, S. J. THANNHAUSER; II, S. J. THANNHAUSER and A. BOMMES (*Hoppe-Seyler's Ztschr. Physiol. Chem.*, 91 (1914), No. 5, pp. 329-335, 336-343).—The results are reported of a large number of experiments carried out with men in good health, and also with rabbits, which show that uric acid is readily formed from a purin base. After subcutaneous injection of guanosin and adenosin, a corresponding increase in uric acid excretion was noted.

Studies on the digestion of the protein of cooked meat in the case of dogs, E. ZUNZ (*Internat. Beitr. Path. u. Ther. Ernährungsstör., Stoffw. u. Verdauungskrank.*, 5 (1914), No. 3, pp. 265-286).—In the experiments here reported laboratory animals (fasting dogs) were fed upon a meat diet of known nitrogenous content. After being killed, at from 1 to 8 hours after the ingestion of the meal, the contents of the fundus, pylorus, and upper part of the intestinal tract were isolated and digested with dilute hydrochloric acid.

Considerable data are given regarding the amounts of protein cleavage products present, but the greater part of the article is devoted to the discussion of the relative value of two methods for separating the soluble nitrogenous matter from the materials not attacked by the acid and from the accumulated proteins.

Of the two methods studied, namely, filtration and centrifuging, the author draws the conclusion that more rapid and correct determination of the nutritive content of protein cleavage products is made by the latter method, when carried out at a speed of 7,000 revolutions per minute.

The excretion of creatinin by normal women, MARTHA TRACY and ELIZABETH E. CLARK (*Jour. Biol. Chem.*, 19 (1914), No. 1, pp. 115-117).—The results of these experiments, in which observations were made upon a number of women kept "upon a strict creatinin- and creatin-free diet for two days or longer," showed a creatinin coefficient below 8. This coefficient as a rule apparently applies to women who have no definite muscular work to perform.

Creatinin and creatin in starvation, G. GRAHAM and E. P. POULTON (*Jour. Physiol.*, 48 (1914), No. 5, pp. LIII, LIV).—In continuation of work previously reported (E. S. R., 30, p. 864), the authors report the results of two complete starvation experiments which "suggest that traces of 'true' creatin are excreted during absolute starvation lasting for three days." In the opinion of the authors, owing to the extremely small amounts found and the liability to error these results do not permit them to draw too definite conclusions.

On uricolysis, A. E. TAYLOR and W. H. ADOLPH (*Jour. Biol. Chem.*, 18 (1914), No. 3, pp. 521-523).—An experiment is reported which shows that an increase in the digestion of purin increases the output of urea nitrogen, while the output of creatinin nitrogen remains constant.

The influence of a vitamin-free diet on the carbohydrate metabolism, C. FUNK and E. VON SCHÖNBORN (*Jour. Physiol.*, 48 (1914), No. 4, pp. 328-331).—In the experiments here reported pigeons maintained upon a vitamin-free diet developed a tendency to hyperglycemia with a decrease of glycogen in the liver. In the case of a sugar-free diet the hyperglycemia was especially marked and was followed by the entire disappearance of liver glycogen. A formation of glycogen in the liver and a diminution of sugar in the blood were produced by the addition of yeast vitamin to the vitamin-free diet. In the case of a fat-free diet an increase was noted in the liver glycogen.

Calorimetric observations on man, J. S. MACDONALD, F. A. DUFFIELD, and K. LUCAS (*Rpt. Brit. Assoc. Adv. Sci.*, 1913, pp. 262-264).—In this progress report various changes in the apparatus are noted, the most important of which is the changing of the calorimeter from one of the closed-type to an open-type form of apparatus. The experiments which have been carried out tend to show that the total transformation of energy varies with the amount of mechanical work performed and not with the length of time of the performance.

The calorimeter has been previously described and earlier work reported (E. S. R., 30, p. 262).

Improved myothermic apparatus, A. V. HILL and V. WEIZSÄCKER (*Jour. Physiol.*, 48 (1914), No. 4, XXXV, XXXVI).—The authors describe an apparatus for measuring the heat production involved in the contraction of isolated muscles in which the rise of temperature of the muscles is measured directly by means of a thermopile.

The energy requirement of the new born, H. C. BAILEY and J. R. MURLIN (*Proc. Soc. Expt. Biol. and Med.*, 11 (1914), No. 4, pp. 109-111).—In determining the desirability, from a physiological standpoint, of supplementing the colostrum with some artificial food during the first three days of life, the energy requirement of the new born was studied in a respiration incubator.

The initial loss in weight, which averaged over 250 gm., was lessened by the supplementary feeding of a milk mixture similar to colostrum. No digestive disturbances were noted in the case of the extra feeding.

"The respiratory quotient reaches as high as 1.0 on the first day of life and indicates the combustion of carbohydrates. Thereafter it drops to 0.67 on the second day and remains in the neighborhood of 0.7 for the following two days, indicating a condition of starvation and the combustion of fat. After the milk secretion is well established the quotient reaches 0.9, which is the normal for a mixed diet."

From a comparison of the energy requirement and the composition of a number of samples of colostrum, the results apparently show that the breast secretion is not sufficient to supply the energy required until the fourth day. "Feeding the new born infants for the first three days, in addition to the breast secretion, a formula of about the same composition as colostrum would appear

to be a logical proceeding not only to fulfill the energy requirement but also to supply the water lost."

The animal organism as a machine, F. REACH (*Fortschr. Naturw. Forsch.*, 10 (1914), pp. 97-130).—A summary and digest of data in which the subject is treated chiefly from the standpoint of thermodynamics. There is included, for example, a study of the different theories which have been offered in explanation of muscular activity.

Mechanical efficiency of man, J. S. MACDONALD (*Jour. Physiol.*, 48 (1914), No. 4, pp. XXXIII, XXXIV).—Several formulas for expressing the efficiency of the human mechanism are discussed.

ANIMAL PRODUCTION.

The chemistry of cattle feeding and dairying, J. A. MURRAY (*London, New York, Bombay, and Calcutta*, 1914, pp. XII+343, pl. 1, figs. 29).—It is the aim of this volume, according to the preface, to develop and explain those fundamental principles which are the basis of all effective control in farming operations, and not to prescribe rules for particular cases. The book is made up of data gathered from American and German sources, and the interpretation of them as based largely upon the results of the Rothamsted investigations. It is assumed that the reader is familiar with the rudiments of inorganic and organic chemistry. The feeding standards of Wolff and Kellner's system of starch values are examined, with an attempt to break away from both and from the rule of three in which they are involved.

The work is divided in four parts. Part 1 on the constituents of plants and animals consists of chapters on the mineral salts, carbohydrates, fats and fixed oils, nitrogenous compounds (amids), nitrogenous compounds (proteins), and ferments and miscellaneous products; part 2 on requirements of animals consists of chapters on nutrition, statics, dynamics, milk production, and increase; part 3 on feeding stuffs deals with the valuation of feeding stuffs, compounding rations, succulent and watery feeds, coarse dry fodders, and concentrated feeds; and part 4 on dairying deals with the composition and general properties of milk, the chemical constituents of milk, and milk products.

The utilization of potato haulms as hay and as silage for ruminants (sheep and dairy cows).—The feeding of artichoke foliage, W. VÖLTZ, A. BAUDREXEL, and A. DEUTSCHLAND (*Landw. Jahrb.*, 46 (1914), No. 1, pp. 105-160).—From experiments conducted at the Agricultural High School of Berlin in feeding dried and ensiled potato haulms, and dried leaves and stalks of Jerusalem artichokes to three sheep and four dairy cows, the following coefficients of digestibility were calculated:

Coefficients of digestibility of potato haulms and Jerusalem artichokes.

Kind of feed.	Organic matter.	Protein.	Fat.	Nitrogen-free extract.	Crude fiber.	Energy.
	<i>Per ct.</i>	<i>Per ct.</i>	<i>Per ct.</i>	<i>Per ct.</i>	<i>Per ct.</i>	<i>Per ct.</i>
Potato haulms, dried.....	64	57	53	68	66	63
Potato, fresh ensiled.....	62	62	66	63	60	58
Potato, dried ensiled.....	65	56	77	67	65	66
Jerusalem artichokes, dried leaves and stalks.....	65	55	70	72	54	66

No bad effect upon the health of the animals was noted in the feeding of these materials. The Jerusalem artichoke was about equal in nutritive value

to good meadow hay. When fed alone, however, it causes strong fermentation in the alimentary canal, so that not more than half the bulky food should be replaced by it.

On the value of the stems and leaves of the sweet potato plant (*Ipomœa batatas*) as a feed material, T. KATAYAMA (*Bul. Imp. Cent. Agr. Expt. Sta. Japan*, 2 (1914), No. 1, pp. 41-74).—From three experiments in feeding sweet potato haulms in various forms to sheep the following average coefficients of digestibility were obtained:

Digestible nutrients and coefficients of digestibility of sweet potato haulms.

Kind of material.	Organic matter.	Protein.	Nitrogen-free extract.	Fat.	Crude fiber.	Starch value.
Dried sweet potato haulms:	<i>Per ct.</i>	<i>Per ct.</i>	<i>Per ct.</i>	<i>Per ct.</i>	<i>Per ct.</i>	<i>Per ct.</i>
Digestible nutrients.....	48.8	4.7	24.8	2.3	17.0	29.6
Coefficient of digestibility.....	55.5	41.9	56.8	59.2	57.9	.....
Ensiled sweet potato haulms:						
Digestible nutrients.....	47.6	5.0	24.9	3.4	14.2	5.7
Coefficient of digestibility.....	54.0	42.0	57.9	67.9	50.3	.....

The sweet potato tops were ensiled in pits, the material being put in in the latter part of October and removed in March. Only a small loss in nutrients was entailed in the ensiling process, and although dark brown in color and somewhat moldy on top the silage was well liked by the sheep. It is stated that sweet potato foliage in the fresh state is very watery and is similar to beet leaves, but contains tannic rather than oxalic acid. The air-dried foliage has a fine aroma and was well relished by the animals.

Manufacture of food for cattle and other animals, J. J. EASTICK and J. J. A. DE WHALLEY (*English Patent*, 14,607, June 24, 1913; *abs. in Jour. Soc. Chem. Indus.*, 33 (1914), No. 15, p. 803).—"Peat moss, containing about 30 per cent of moisture, is treated in an autoclave with 3.5 per cent of its weight of gaseous sulphur dioxide, and then heated for about 30 minutes by the introduction of steam under a pressure of 100 lbs. per square inch."

Inspection of commercial feeding stuffs, P. H. SMITH and C. L. BEALS (*Massachusetts Sta. Control Ser. Bul. 1* (1914), pp. 4-61).—Analyses are given of the following feeding stuffs: Cotton-seed meal, linseed meal, gluten meal, gluten feed, distillers' dried grains, malt sprouts, brewers' dried grains, wheat middlings, wheat bran, molasses feed, corn meal, ground oats, rye meal, hominy meal, provender, dried beet pulp, meat scrap, bone meal, fish meal, milk albumin, and various mixed and proprietary feeds. A discussion of the results obtained is appended.

The acidity of important commercial feedstuffs, L. WILK (*Ztschr. Landw. Versuchsw. Österr.*, 17 (1914), No. 5, pp. 231-269).—A study was made of the fatty acid content of various commercial feedstuffs, including pumpkin-seed cake, sunflower-seed cake, rape-seed cake, linseed cake, peanut cake, sesame cake, and rice-feed meal.

Animal husbandry, G. H. TRUE (*California Sta. Rpt. 1914*, pp. 98-100, figs. 5).—Four lots of 25 steers each were fed all the beet pulp they would eat, lot 1 also receiving 15 lbs. alfalfa hay, lot 2, 20 lbs. alfalfa hay, lot 3, 7½ lbs. barley hay, and lot 4, rye grass hay and 2 lbs. horse beans daily. Lots 3 and 4 made the largest gains, there being but little difference between lots 1 and 2. In steer-feeding experiments, including about 2,000 animals, in which

grain feeds were fed supplementary to alfalfa hay, it was found that the best returns obtained were with barley and alfalfa hay, the average daily ration fed being 5.5 lbs. of barley and 21.8 lbs. of hay.

Four lots of 15, 76-lb. pigs were fed for a 70-day period as follows: Lot 1 barley alone, lot 2 barley and alfalfa pasture, lot 3 barley, alfalfa pasture, and shorts, and lot 4 barley, alfalfa pasture, shorts, and skim milk. They made an average daily gain per head of 0.75, 0.81, 0.85, and 1.27 lbs., respectively. A fifth lot weighing 114 lbs. per head and fed barley, alfalfa pasture, shorts, and skim milk gained 1.57 lbs. daily.

Two lots of 114-lb. pigs fed barley, one lot being on alfalfa pasture and the other being fed green alfalfa, made practically the same gains.

Corn silage and cotton-seed hulls for fattening beef cattle, R. S. CURTIS, L. W. SHOOK, and F. T. MEACHAM (*Bul. N. C. Dept. Agr.*, 35 (1914), No. 8, pp. 5-28, figs. 17).—Two lots of 24 head each of 900-lb., native grade, Shorthorn feeders were fed during a 112-day feeding period equal amounts of cotton-seed meal, lot 1 receiving in addition corn silage, lot 2 cotton-seed hulls. The average amount of cotton-seed meal fed daily was $7\frac{1}{2}$ lbs. per steer, of corn silage 42.46 lbs., and of cotton-seed hulls 21.95 lbs. The average daily gain per steer for lot 1 was 1.62, and for lot 2, 1.63 lbs.; the cost of feed per pound of gain 11.4 and 10.9 cts.; the profit per steer \$8.29 and \$11.36.

It is noted that the steers in lot 2 sold for 20 cts. more per hundredweight than those in lot 1. They were in better condition, thicker, smoother, and with a more uniform distribution of fat. A slaughter test made at the beginning of the experiment indicated that the steers in lot 1 would dress 52.24 per cent, and those in lot 2, 54.53, while at the close of the experiment the respective values were 52.24 and 56.41 per cent. It required to make 100 lbs. gain in lot 2 1,352.2 lbs. of cotton-seed hulls, in conjunction with 458 lbs. of cotton-seed meal, and in lot 1, 2,611.4 lbs. of corn silage with 458 lbs. of cotton-seed meal.

Charging cotton-seed hulls at \$7.50 per ton, cotton-seed meal at \$27.75, and corn silage at \$3.50, the values returned were \$8.38 per ton for hulls, \$5.25 for silage, and \$30.34 for cotton-seed meal fed with hulls, or \$37.71 fed with silage. All of these figures were exclusive of the manurial value of the feeds.

Indian cattle in the Philippines, C. W. EDWARDS (*Philippine Agr. Rev. [English Ed.]*, 7 (1914), No. 7, pp. 288-291, pl. 1).—An account of the breed characteristics, utility value, and possibilities of improvement of the principal breeds of zebu (*Bos indicus*) cattle in the Philippines.

It is stated that the Nellore is the only breed with which any definite breeding experiments have been carried on in the country. They are silvery gray with darker shadings over front and hind quarters, pure white, and occasionally red and white in color. This breed has been imported into Brazil, Argentina, Java, and Africa in considerable numbers for crossing upon indigenous stock, and a few have been imported into the United States, particularly into Texas. Characters which commend these cattle are their high resistance to rinderpest, tick fever, and insect pests, vigorous rustling qualities, excellence as work animals, and their value as a cross or factor for upgrading native stock. However, as regards conformation they are inclined to be slab-sided and often have a tendency to be vicious. More extensive importation and breeding of these Indian cattle in the Philippines is recommended.

Influence of summer shearing on the skin temperature of sheep, R. TRAUT (*Der Einfluss der Sommerschur auf die Hauttemperatur des Schafes. Inaug. Diss., Univ. Giessen, 1913; abs. in Zentbl. Physiol.*, 28 (1914), No. 4, p. 221).—In summer at a temperature of from 16 to 24.75° C. (60.8 to 86.6° F.), un-

sheared sheep showed a body temperature of from 34 to 38.5°, while sheared sheep ranged between 30.6 and 36.3°.

Caracul sheep in Argentina (*Bol. Min. Agr. [Buenos Aires]*, 17 (1914), No. 1, pp. 127-130; *abs. in Internat. Inst. Agr. [Rome]*, *Mo. Bul. Agr. Intel. and Plant Diseases*, 5 (1914), No. 7, p. 917).—An account of an importation made in 1911. It is noted that wet, damp soil has proved very disastrous to the pure-bred sheep, which contracted serious parasitic diseases. The lambs of both the first and second generation have remained true to type without showing any signs of degeneration.

The value of silage in the winter ration for the breeding flock, J. M. JONES (*New Hampshire Sta. Circ.* 16 (1914), pp. 3-16).—Five lots of five yearling lambs each were fed per day during three winter months as follows: Lot 1 alfalfa hay 1, native hay 0.25, roots 2.5, and cracked corn 0.25 lbs.; lot 2 native hay 1.5, roots 2.5, cracked corn 0.125, and oil meal 0.2 lbs.; lot 3 alfalfa hay 1, native hay 0.25, corn silage 2, and cracked corn 0.25 lbs.; lot 4 native hay 1.25, corn silage 2, oil meal 0.2, and cracked corn 0.125 lbs.; and lot 5 native hay ad libitum, roots 1 lb., and oats and bran 1:1, 2 oz. The following average gains were made per head: 7.6, 2.9, 4.4, 4.5, and -0.2 lbs., respectively. In a duplicate experiment the following year, the following gains were obtained: 4.7, -0.1, -0.7, 0, and -2.6 lbs., respectively.

The first four rations are recommended for winter feeding of the breeding flock, but the fifth ration was unsatisfactory. Lambs on roots made a slightly larger gain than those receiving silage. Native hay and silage appeared to be as satisfactory as alfalfa hay and silage.

[Animal husbandry experiments], B. YOUNGBLOOD (*Texas Sta. Rpt.* 1913, pp. 59, 60).—In sheep breeding experiments conducted with a pure-bred caracul ram and pure-bred Lincoln, Hampshire, Shropshire, and Southdown ewes, it has been found that the growthiness and vigor of the rams and the very good quality of the fur resulting from the first cross make the possibilities for the development of both mutton- and fur-bearing breeds very encouraging.

From trials with goats on clearing land of stumps it is estimated that in two years goats have killed 90 per cent of the stumps on what was previously wooded land. These goats are yielding from \$1.00 to \$1.50 worth of mohair, and from 85 to 90 per cent of the does are raising a kid annually.

The sheep and wool industry of Australasia, H. B. SMITH (*London, Melbourne, and Christchurch, New Zealand*, 1914, pp. XVI+187, figs. 70).—An account of the history and development of the sheep and wool industry in Australasia with chapters on shearing, care of wool, wool sorting, manufacturing textile fibers, wool classing, pressing the clip, wool scouring, selling and buying, and killing, skinning, and dressing a sheep.

A dynamometric calculation of the character of wool fiber, W. MACHA (*Deut. Landw. Tierzucht*, 18 (1914), No. 29, pp. 345, 346, fig. 1).—A dynamometer for determining the elasticity and strength of wool fibers, recently designed by a mechanic in Leipsic, is described.

Nitrogen retention from allowances of ammonia salt or urea.—Experiments with permanent intravenous injection, V. HENRIQUES and A. C. ANDERSEN (*Hoppe-Seyler's Ztschr. Physiol. Chem.*, 92 (1914), No. 1, pp. 21-45).—In these experiments, which were performed upon goats, the authors were unable to secure a permanent nitrogen retention when urea and other nitrogen-containing substances were intravenously injected into the animals. The nitrogen retention reported by Grafe (*E. S. R.*, 31, p. 265) is thought

to be due to bacterial influence or to the retention in the intestinal canal of the substances in an unchanged form.

Studies on the extent of hippuric acid formation in the body of swine, E. ABDERHALDEN and H. STRAUSS (*Hoppe-Seyler's Ztschr. Physiol. Chem.*, 91 (1914), No. 1-2, pp. 81-85).—For swine fed an ordinary ration of bran and potatoes the estimated hippuric-acid excretion was 1.15 gm. per day; for those fed from 5 to 10 gm. of benzoic acid, 2.5 to 3 gm.; those fed 5 gm. benzoic acid and 6 gm. glycine, 3.74; 10 gm. benzoic acid and 12 gm. glycine, 4.51; 10 gm. benzoic acid and 12 gm. alanin, 3.3 gm.; and 10 gm. benzoic acid and 15.5 gm. ammonium carbonate, 2.2 gm. The experiments show that the pig has available much more glycine than it absorbs in the proteins of its food.

The self-feeder for swine feeding, J. M. EVVARD (*Iowa Agr.*, 15 (1914), No. 1, pp. 17-19, figs. 3).—A comparison at the Iowa Station of pigs, hand- v. self-fed, taken from weaning to 250 lbs. in weight on alfalfa pasture and finished in the dry lot when the alfalfa season was over, showed an average daily gain per head of 1.06 lbs. where corn and meat meal were hand-fed, and 1.22 lbs. where self-fed. The cost per pound of gain was 3.96 cts. for the former and 3.83 cts. for the latter.

Productive swine husbandry, G. E. DAY (*Philadelphia and London* [1913], pp. X+330, pls. 2, figs. 70).—A general treatise on the breeding, feeding, care, and management of swine, together with a summary of results of swine-feeding experiments.

Digestion experiments with Equidæ, O. FRANCK (*Kühn Arch.*, 3 (1913), pt. 2, pp. 363-396, pls. 2).—This reports digestion experiments made with eight animals of the Equidæ group fed 10 kg. each of hay and oats per 1,000 kg. live weight, during a seven-day preliminary period and a ten-day experimental period. Comparative body measurements of the several animals are given. The digestive coefficients are given in the following table:

Digestion coefficients for Equidæ.

Kind of animal.	Dry matter.	Protein.	Fat.	Nitrogen-free extract.	Crude fiber.	Ash.
	<i>Per ct.</i>	<i>Per ct.</i>	<i>Per ct.</i>	<i>Per ct.</i>	<i>Per ct.</i>	<i>Per ct.</i>
Ass, male.....	63.04	65.01	39.35	39.56	34.32	76.10
Ass, female.....	67.53	66.41	49.09	49.05	20.42	80.25
Mule, male.....	71.72	73.50	51.12	46.53	37.90	85.54
Mule, female.....	66.06	66.57	61.79	46.16	32.20	77.42
Horse.....	62.32	71.08	34.51	37.82	28.81	74.59
Mare.....	67.10	70.73	42.39	45.46	31.04	79.79
Mule, male.....	64.04	66.47	39.20	43.48	39.71	75.87
Mule, female.....	63.00	58.87	39.78	40.06	35.53	76.83

Early studies made by Sanson are cited, comparing the coefficient of digestibility for the horse and mule as follows: Dry matter 61 and 67, protein 76 and 82, fat 60 and 62, nitrogen-free extract 71 and 79, crude fiber 63 and 57, and ash 42 and 69 per cent, respectively.

Study of the proportions of the horse, L. VAN MELDERT (*Ann. Gembloux*, 24 (1914), Nos. 3, pp. 121-151, figs. 2; 5, pp. 249-274, figs. 5; 6, pp. 305-336, figs. 17; 7, pp. 369-391, figs. 6; 8, pp. 425-452, figs. 5).—This is an account of an extensive study made of the body measurements and general conformation of the various breeds of draft and light horses.

Breeds of draft horses, G. A. BELL (*U. S. Dept. Agr., Farmers' Bul.* 619 (1914), pp. 16, figs. 10).—An account of the breed characteristics and desirable

qualities of the Belgian, Percheron, French Draft, Clydesdale, Shire, and Suffolk breeds of draft horses under American conditions.

The South Oldenburg horse and the influence of environment, H. BURMEISTER (*Kühn Arch.*, 3 (1913), pt. 2, pp. 397-505).—A description is given of the climatic and environmental conditions of South Oldenburg, together with a review of the history of horse breeding in that Province since 1820. Body measurements were made of stallions, mares, and geldings from 1 to 21 years old.

A comparison of these measurements shows an increase in height at the withers, height of back, height at croup, breast circumference, breadth of breast, and breadth of croup during the past 20 years. Color has changed slightly, brown greatly predominating but on the decrease, black and chestnut increasing, and white decreasing.

The Beery system of horsemanship, J. BEERY (*Pleasant Hill, Ohio, 1914*, pp. [313], pl. 1, figs. 172).—A series of lessons on special methods of horse-breaking and training. The topics included are colt training, disposition and subjection, kicking and balking, shying and running away, shoeing, halter pulling, promiscuous vices, overcoming special fears, and teaching tricks.

The anterior lobe of the pituitary body in its relationship to the early growth period of birds, ROSALIND WULZEN (*Amer. Jour. Physiol.*, 34 (1914), No. 2, pp. 127-139, figs. 7).—From experiments carried on with two groups of White Leghorn chickens two and nine days old at the start, and fed an amount of pituitary material roughly equal to 0.01 of the average body weight of the chicks, and compared with liver-fed chicks, it is concluded that "the growth of young fowl is retarded by the addition to the diet of fresh, unmodified anterior lobe of ox pituitary. This is shown both in body weight and in length of the long bones. Involution of the thymus accompanies this retardation and may bear a causal relation to it. These effects are more marked in the males than in the females."

The influence of the male parent on the character of the eggshells in fowls, A. R. WALTHER (*Landw. Jahrb.*, 46 (1914), No. 1, pp. 89-104).—Dwarf fowls, comprising three different breeds, and medium-sized fowls, also comprising three breeds, were interbred, all the hens being first mated with cocks of their own breed, and the cock being then removed and an interval of ten days allowed to elapse before he was replaced by a cock of another breed. It was concluded that the fact of the cock's belonging to a different breed had no influence upon either the weight, shape, color, or gloss of the eggs, thus discrediting the claims of influence of telegency made by certain investigators.

The histological basis of the different shank colors in the domestic fowl, H. R. BARROWS (*Maine Sta. Bul.* 232 (1914), pp. 237-252, pls. 6).—In a study of the histological conditions that are associated with the different shank colors observed in fowls it was found that "yellow and variations are due to the presence of lipochrome pigment in the epidermis, with the absence of melanin pigment. White results from the lack of pigment. Blue color obtains when melanin pigment lies in the upper dermis, with the absence of this type of pigment in the epidermis. Black and variations depend upon the presence of melanin pigment in the epidermis. Green appears when lipochrome pigment lies in the epidermis, and melanin pigment in the corium only. All shades, with the exception of red and pink, are the result of various combinations of these pigments: Orange-yellow and black-brown."

A table is given showing the nature and location in the skin of the different types of pigment concerned in producing each shank color. A bibliography of 14 references is included.

Natural and artificial brooding of chickens, H. M. LAMON (*U. S. Dept. Agr., Farmers' Bul. 624 (1914), pp. 14, figs. 10*).—This gives practical instructions in both natural and artificial brooding of chickens, and includes descriptions of the brooders used, together with an explanation of the most approved methods of heating and handling, and data on feeding chickens.

European milk chickens (*N. Y. Produce Rev. and Amer. Cream., 38 (1914), No. 17, pp. 728, 729*).—The production of milk chickens is confined to sections of France, Belgium, and northwestern Germany. In France the Faverolle is the favorite breed for this purpose. It is a large bird and a rapid grower, putting on flesh at all times. At six to eight weeks old the chicks weigh 8 to 12 oz. After they have reached a certain age they are specially fed for two weeks on oatmeal, buckwheat meal, sometimes a little barley meal, and cooked rice mixed with soured skim milk. For every 100 birds it is customary to add per day about one-half pound of pure fat, preferably mutton.

In Belgium the Campine and Malines breeds are largely used, while in Germany Orpingtons and Wyandottes are in favor.

Method of desiccating eggs, T. HARA (*U. S. Patent, 1,100,973, June 23, 1914; abs. in Jour. Soc. Chem. Indus., 33 (1914), No. 15, p. 803*).—"Yolks and whites of eggs are beaten up separately, then mixed and dried in thin layers on metallic plates heated to about 110° F. (43° C.), the drying operation being carried out in a dark room the air in which is dried and heated to about 105° F."

Seasonal changes in testes and plumage in wild duck, C. G. SELIGMANN and S. G. SHATTOCK (*Proc. Zool. Soc. London, 1914, I, pp. 23-43, figs. 6; abs. in Jour. Roy. Micros. Soc. [London], No. 4 (1914), pp. 341, 342*).—The authors have inquired into the reality of a correlation between seasonal changes in the testes and the "eclipse" plumage of the mallard.

"As in many other birds, the testes of the mallard undergo a series of seasonal changes, and are spermatogenic only during the winter months and early spring. But the two periods of activity and nonactivity do not coincide with the two seasonal changes in the plumage. The normal passage of the bird from full winter (breeding) plumage to its dusky summer (eclipse) plumage is, however, delayed if castration is effected during the months whilst the gonads are assuming or have attained activity. One bird which was castrated in the winter, and in which the advent of the succeeding eclipse was delayed the following summer, was kept until the summer of the next year. The second eclipse occurred at the normal period, but nodules of regenerated testicular tissue were found. It is a remarkable fact that the grafts were fully spermatogenic in the month of September, an occurrence altogether abnormal in the testicle of the entire bird. The delay above referred to has its parallel in the well-established fact that if a colt is castrated when shedding its winter coat, the shedding is for a time arrested and then proceeds only very slowly. When wild ducks assume the drake plumage the spurious males undergo the seasonal eclipse, but this is somewhat incomplete and aberrant.

"Removal of the testes during the eclipse does not produce any constant appreciable effect upon the next passage of the bird into winter plumage. It would appear that the seasonal change of plumage in the mallard is not connected with the spermatogenic function of the testicle, but the influence of a hormone was not excluded since the castration never prevented some regrowth of testicular tissue."

The transmission of secondary sexual characters in pheasants, ROSE H. THOMAS (*Jour. Genetics, 3 (1914), No. 4, pp. 275-298, pls. 6, figs. 2*).—The results of breeding experiments with pheasants, to determine the extent of transmission of secondary sexual characters, are reported.

The development of the stomach in the Euphonias, A. WETMORE (*Auk*, 31 (1914), No. 4, pp. 458-461).—In attempting to account for the aberrant form of stomach of the small brightly colored tanagers, the author studied 51 specimens of the Porto Rican Euphonia (*Tanagra sclateri*). This species feeds entirely on the berries of mistletoe (*Phoradendron* spp.), a food readily assimilated and one not requiring a muscular stomach for its digestion. "In consequence we have a degeneration of the ventriculus into a thin membranous band and a straightening of the stomach to facilitate the passage of food, no cardiac or pyloric constriction being necessary to hold matter in the ventriculus for digestion as the process of conversion is carried on wholly by the secretions of the alimentary canal."

Pigeons for profit.—The whole art of squab-raising with chapters on fancy and racing pigeons, P. BRETTON (*London*, 1914, pp. 125, pls. 9, figs. 24).—This contains general information on the feeding, care, and management of pigeons for commercial purposes.

Squab secrets, W. E. RICE (*Philadelphia*, 1914, pp. 48, figs. 21).—Methods of feeding, care, and management of pigeons for commercial purposes are described.

The first poultry show in America, J. H. ROBINSON (*Boston*, 1913, pp. 31, figs. 10).—An account of this show, which was held at the Public Gardens, Boston, Mass., in November, 1849.

DAIRY FARMING—DAIRYING.

The value of soy-bean and alfalfa hay in milk production, R. E. CALDWELL (*Ohio Sta. Bul.* 267 (1913), pp. 125-145, figs. 2).—In 1908 two lots of five and six cows each, producing approximately the same amount of milk, were fed during a 31-day preliminary period, a 60-day experimental period, and a subsequent 30-day period as follows: Lot 1 corn silage, soy-bean hay, and a grain mixture of corn meal and cotton-seed meal 6:1; lot 2 corn silage, corn stover, and a grain mixture of corn meal, wheat bran, and cotton-seed meal in equal parts. Lot 2 received slightly more protein and fat, yet the two rations were very close in total composition. Lot 2 gave slightly more milk and milk fat daily per cow than lot 1, but this difference did not change with the change of ration, indicating that the two rations were practically equal in feeding value so far as milk and milk fat production are concerned. The gain in live weight was practically the same in both lots. A comparison of the amount of dry matter consumed per unit of product, milk or milk fat, indicates that the difference is very small.

The average daily cost of feed for lot 1 was 15.5 cts. per cow; the average cost per pound of milk produced 0.86 ct., and per pound of milk fat produced 17.9 cts. The average daily value of the product was 25 cts. per cow. For lot 2 the average costs were 16.4, 0.86, and 18.5 cts., respectively, and the value of product 25.6 cts. per cow.

In 1909 a similar test to the above was conducted and in general confirmed the results obtained in this first test. It appears that 5 per cent more dry matter was required to produce a unit of product with the grain ration than with the soy-bean ration, but the difference is small and means that the two rations were practically equally efficient. These tests indicate that a large share of the protein can be supplied in soy-bean hay instead of concentrates with equal efficiency.

Two lots of six cows each were fed during a 28-day preliminary period, a 56-day experimental period, and a 28-day subsequent period as follows: Lot 1 corn meal, corn silage, and alfalfa hay; lot 2 corn meal, wheat bran, cotton-seed

meal, corn silage, and corn stover, the nutritive ratio of the two rations being practically the same. Lot 1 consumed less protein and more crude fiber than lot 2. Lot 1 produced slightly more milk than lot 2, but slightly less milk fat. This difference in fat is thought to be due to the difference in the original percentage of milk fat between the two lots. The difference remains quite constant throughout the three periods, indicating that the two rations were practically equal in efficiency.

Lot 1 made an average gain in weight per cow of 36.5 lbs. and lot 2 of but 1 lb. Every cow gained on the alfalfa ration while three gained and three lost on the other ration. Lot 1 consumed 16.6 per cent more dry matter per 100 lbs. of milk and 19.3 per cent more per pound of milk fat. It is thought that more carbohydrates and fat were given than were required for milk production.

The average daily cost of feed for lot 1 was 16 cts., the cost to produce 1 lb. of milk 0.81 ct., and 1 lb. of milk fat 18 cts. For lot 2 the costs were 17, 0.85, and 19 cts., respectively. From this test it is seen that alfalfa as well as soy beans can replace most of the high-priced protein concentrates.

Feeding experiments with rice-gluten meal, E. REISCH, M. SCHWEIGER, and J. HANSEN (*Deut. Landw. Tierzucht*, 18 (1914), No. 21, pp. 245-248).—Rice-gluten meal is a concentrated feed found in the German markets. It consists of a mixture of rice gluten, a product of rice starch, and of rice meal, an offal from rice middlings. Its composition is given as follows: Dry matter 92.3 per cent, protein 36.94, fat 11.86, carbohydrates 36.87, crude fiber 1.32, and ash 5.31. Feeding experiments show that for dairy cows the feed is equal in feeding value to a mixture of peanut cake, dried-beet slices, and wheat bran.

[Dairy husbandry studies], G. H. TRUE (*California Sta. Rpt.* 1914, pp. 93-98).—Fourteen cows fed barley in addition to alfalfa produced 16.2 per cent more milk and 13.2 per cent more milk fat than when fed alfalfa hay alone, and they also gained 12 lbs. more per head in body weight. The feeding of silage in addition to alfalfa to cows was followed by a gain of 22 per cent in milk, 10.8 per cent in milk fat, and 12.3 per cent in milk solids over a roughage feed composed of alfalfa alone.

In trials to determine the efficiency of the milking machine it was found that the average time required for milking cows by machine was 10.9 minutes, and 0.78 lbs. of milk was obtained per minute (strippings included). The corresponding data for hand milking were 4.3 minutes and 1.78 lbs. The cows produced 8.2 per cent less milk and 6.7 per cent less milk fat on the 4-week period of machine milking than on the preceding and following two weeks of hand milking. On the average the machine left from 1.2 to 6.8 lbs. of strippings per day to be milked out by hand, containing from 11.8 to 66.4 per cent of the total amount of milk fat produced by the cows. The average left for all cows was 3.5 lbs. of strippings per day and 37.2 per cent of the total fat in these.

Dairying on cut-over pine lands, E. B. FERRIS (*Mississippi Sta. Bul.* 166 (1913), pp. 24, figs. 4).—A general discussion of methods of feeding, care, and management of dairy cattle under south Mississippi conditions, particularly the cut-over pine lands.

Relation between growth of bone, horn development, and performance in cattle, M. MÜLLER and K. NARABE (*Landw. Jahrb.*, 46 (1914), No. 1, pp. 1-40).—In a study made of Dutch, Ayrshire, and Simmental cows, the circumference of cannon bone and the length and circumference of the horns were taken as test measurements. The animals were divided into groups and their relation studied.

It was found that in the breeds examined, an increase in the size of the bones was correlated with a decrease in the thickness and length of the horns.

This correlation was more marked in the Ayrshire than in Simmental and Dutch cows. Imported and Hokkaido (Japan)-bred Ayrshire and Dutch cows did not show any appreciable difference in the circumference of the cannon bone. The absolute circumference of the horns seems to diminish from generation to generation in Ayrshire and Dutch cows bred in Japan, while the absolute horn length of the Ayrshire cows born in Japan is greater than in the original Ayrshires, but in the Dutch cows the opposite takes place. The different growth of the horns in the original breeds, and in the animals raised in Japan, is attributed to the difference in environment.

The small-boned Ayrshire cows are in general, notwithstanding their relatively smaller live weight, better milkers than the large-boned ones weighing about 110 lbs. more. Also the fine-horned Ayrshires under experiment proved better milkers than the thick-horned ones, while length of horn was not correlated with any difference in this respect. It appears that well developed bones and slightly developed horns in young animals point to a continuation of growth of the body, while moderately developed bones together with highly developed horns are signs that body growth will stop early.

Body weight and milk yield (*Milchw. Zentbl.*, 43 (1914), No. 4, pp. 103, 104).—Tests were made which indicate that heavier cows give proportionately more milk than lighter ones. Cows that were five years old, or had calved not less than three times, were grouped according to body weight. Cows of 1,000 lbs. averaged 3,228 kg. milk with 105.3 kg. butter; 1,200 lbs., 3,571 kg. and 114.6 kg.; and over 1,200 lbs., 3,686 kg. and 118.7 kg. The utilization of feed represented 6.54 efficiency units for light cows and 7.02 for heavy ones.

Simultaneous tests showed that the purer bred cows, i. e., those registered which showed more correct structure than the unregistered ones, also excelled in milk yield. The average for registered cows of the Shorthorn type was 3,526 kg. milk and 113.8 kg. butter, with a feed utilization of 6.87 units, as against 3,281 kg. milk and 104.6 kg. butter with 6.54 units for unregistered cows.

Observations in Britain on Kerries and Dexters, C. S. PLUMB (*Amer. Kerry and Dexter Cattle Club Bul.* 4 (1914), pp. 15, figs. 6).—A general description of the native environment, breed characteristics, and utility value of these breeds.

Red Poll dairy cattle.—Report on the departmental herd for the season 1913-14, R. R. KERR (*Jour. Dept. Agr. Victoria*, 12 (1914), No. 9, pp. 528-537, figs. 10).—In four annual tests of a Red Poll herd of from 12 to 22 animals, the milk yield ranged from 5,750 to 6,564 lbs., the fat test from 4.4 to 4.8 per cent, the pounds of fat from 255 to 304, and the average milking period from 261 to 285 days.

Dairy record centers and cow testing, C. F. WHITLEY (*Rpt. Dairy and Cold Storage Comr. Canada*, 1914, pp. 75-103).—Included in this are data on contrasts in yield and percentage of fat in the same herd, and a comparison of herds as to yields and cost of feed and profits.

Increasing milk flow by frequent milking (*Milchw. Zentbl.*, 43 (1914), No. 4, pp. 100, 101).—In tests made of the Hegelund method of milking, it is claimed that one cow gave 7 lbs. of milk daily three weeks after calving when milked three times a day, and on the same ration when milked eight times a day 20 lbs. After three weeks she was restored to the three times per day milking and continued to give the higher amount of milk. Another cow gave from 10 to 12 lbs. milk per day on three times milking and 29 lbs. when milked seven times per day, which amount she continued to give when returned to three times milking.

By the Hegelund method the cow is milked every two or three hours for the first few days after calving, and then five times per day for three or four weeks.

The effect of pituitary extract on milk secretion in the goat, R. L. HILL and S. SIMPSON (*Quart. Jour. Expt. Physiol.*, 8 (1914), No. 2-3, pp. 103-111, fig. 1; *abs. in Lancet* [London], 1914, II, No. 12, pp. 753, 754).—As the result of their researches, the authors have found that “intravenous or subcutaneous injection of the extract obtained from four ox pituitaries produced a marked increase in the amount of mammary secretion of a goat when milked 15 minutes after injection. A corresponding decrease below normal follows at the next milking several hours later. As pointed out by Hammond [*E. S. R.*, 31, p. 272], there is also a marked rise in fat content in the milk secreted after injection, but there is no sudden fall in the fat percentage at the next milking, as was observed by this investigator. The solids-not-fat of the milk appear to be unaffected by the extract.”

Dairy bacteriology, C. L. ROADHOUSE (*California Sta. Rpt.* 1914, p. 184).—From examinations made by R. S. ADAMS of 100 samples each of milk, skim milk, and cream, coming from different sources, it is concluded that “the proportion of bacteria distributed from whole milk into skim milk and cream by means of a centrifugal separator varies in different classes of milk. The skim milk and cream resulting from the separation of fresh certified milk each had a bacterial content about equal to that of the original milk. The skim milk resulting from the separation of fresh market milk contained 29.5 per cent less bacteria per cubic centimeter and the cream 51.4 per cent more bacteria than the milk from which it was separated. When old market milk was separated, the resulting skim milk contained 15 per cent less bacteria and the cream 25 per cent more bacteria than the whole milk.”

Observations upon the bacteria found in milk heated to various temperatures, W. W. FORD and J. C. PRYOR (*Bul. Johns Hopkins Hosp.*, 25 (1914), No. 283, pp. 270-276).—The authors have attempted to confirm the earlier findings of Flügge to the effect that “milk always contains the heat-resistant spores of aerobic and anaerobic bacteria, which, by their development, can give rise to disagreeable and unwholesome changes in milk, converting it from a food of great nutritive value into an undesirable if not a dangerous article of diet.”

In a study of 78 samples of Baltimore milk, representing 21 different dairies, it was found that “these changes take place in milk heated to any temperature from 65 to 100° C. and kept at any temperature from 22 to 37°, but not at that of the ice box, 4 to 6°. The spores of the bacteria causing these changes survive in milk for long periods of time on ice and can initiate the same changes in milk kept on ice when transferred to higher temperatures. There is a danger zone in the heating of milk which may be described as ranging from about 65 to 85° in which milk will never clot normally. Below this temperature heated milk may clot normally. Above this temperature milk will either clot or slowly peptonize.

“The problem of pasteurization of milk must be worked out on the basis of the changes which occur in milk heated to 60 to 65° and the result may depend upon the original character of the milk, upon local bacterial infections of milk, on the character of the stables in which the milk is first obtained, upon methods of preservation, or upon unknown factors. Further investigation alone can determine these points. With our present knowledge as to the difficulty of getting milk free from pathogenic organisms the safest milk is that which has been boiled for a time varying from ten minutes to half an hour

and then preserved on ice. In such milk the organisms giving rise to explosive and putrefactive changes are destroyed, while the organisms which remain usually coagulate the milk or coagulate it and then peptonize it. Rarely they peptonize it without coagulation. While these bacteria may give rise to severe derangements of metabolism in children, and even to disease, as Flügge maintains, this has not yet been clearly shown clinically. Danger from them may probably be almost entirely eliminated by keeping the milk on ice from the time of boiling till the time of use. Milk heated to any temperature from 60 to 100° must be kept on ice, since heated milk is far more apt to decompose than raw milk."

On the presence of spore-bearing bacteria in Washington market milk, J. C. PRYOR (*Bul. Johns Hopkins Hosp.*, 25 (1914), No. 283, pp. 276-278).—The author states that "from the study of over 50 samples of Washington market milk representing fairly accurately the different kinds of milk sold in the city, we are able to confirm Flügge's original observation as to the presence of spore-bearing bacteria. In our experience the most important anaerobic species is *Bacillus ærogenes capsulatus*, which we believe to be universally present. Aerobic spore-bearing bacteria are also found in practically all samples, such organisms belonging in general to the group of gelatin liquefiers. Such species do not develop normally in raw milk nor in the milk sold in Washington as 'pasteurized,' only the ordinary lactic acid bacteria being found.

"All these spore-bearing organisms have a profound effect upon milk and when their development is not hindered by the lactic acid bacteria will produce changes of decomposition and putrefaction, rendering the milk unfit for food. How far they play a rôle in clinical conditions, especially in children, remains to be proved."

The relationship of septic sore throat to infected milk, J. A. CAPPS and D. J. DAVIS (*Jour. Infect. Diseases*, 15 (1914), No. 1, pp. 130-134, figs. 2).—A report of an investigation made of certain dairy farms and milk-delivering stations of Chicago, in which it was found that a single farm where mastitis was prevalent in the cows and sore throat in the milkers, and which was delivering to a dairy company that did not pasteurize, was the direct cause of an extensive sore throat epidemic.

[Germ content of salt], H. WEIGMANN (*Jahresber. Vers. Stat. Molkw. Landw. Kammer Schleswig-Holstein*, 1913, pp. 9, 10).—Bacteriological analyses made of various kinds of salt showed that shipments fresh from the mine contained but few bacteria. Salt kept in barrels in the creamery showed a high bacteria content in the top layers and much less in the lower parts. The fungus and spore-forming varieties were in evidence and were found to attack the milk fat.

A new process for the sterilization of milk, using high-potential electric discharges, J. B. C. KERSHAW (*Milk Dealer*, 3 (1914), No. 12, pp. 32-34, fig. 1; 4 (1914), No. 1, pp. 58-60, fig. 1).—This is a detailed account of an electrical process for sterilizing milk which is claimed to have met with marked success in tests made by the municipality of Liverpool, England, and by various individual investigators.

[The "biorizator"], H. WEIGMANN (*Jahresber. Vers. Stat. Molkw. Landw. Kammer Schleswig-Holstein*, 1913, pp. 11-15).—It is stated that milk heated with the biorizator so preserves the characteristics of raw milk that the odor and taste are in no way impaired. The enzymes of the milk, catalase and reductase, are preserved in spite of the high heating. The coagulability is only reduced to a very small extent, but the cheese is softer than that from raw milk. The skimming of the milk is not interfered with, the cream rising more

quickly though possibly not so thoroughly as on raw milk. The keeping quality is increased $1\frac{1}{2}$ days, and since the lactic acid bacteria are not entirely destroyed, the milk becomes sour when old.

[Dairy experiments], G. H. BARR (*Rpt. Dairy and Cold Storage Comr. Canada, 1914, pp. 71-74*).—In comparing the shrinkage in weight of different packages of Cheddar cheese it was found that at the end of seven days the full-sized cheese had shrunk 1.13, the flat 1.52, and the 10-lb. cheese 2.15 per cent; after 28 days 1.9, 2.51, and 3.46 per cent, respectively. The average percentage of shrinkage between the weight of the curd and the weight of the cheese was on the seventh day after manufacture 7.36, 8.18, and 9.37, and on the twenty-eighth day 8.13, 9.17, and 10.68, respectively.

Butter made from whey in the summer months proved to be unsatisfactory, the butter being of a soft consistency. The average pounds of whey butter made from 1,000 lbs. of milk was 2.03.

In comparing insulated-milk cans and ordinary cans it was found that the former increased in temperature about 7° F., while the latter increased 30°.

No constant relation between the casein and fat contents of milk was found, except that in general the richer milk showed a higher percentage of casein than the poorer milk. The percentage of casein did not vary to the same extent as the percentage of fat in the herd milk. There was found to be a wide variation in both the fat and casein in herd milk as delivered to the cheese factory from day to day, the average difference in 24 fat tests being 0.4 per cent, and in 24 casein tests 0.306 per cent. The Hart casein test is not regarded as practicable in buying milk for the ordinary cheese factory.

Formation of turnip flavor in butter, H. WEIGMANN and A. WOLFF (*Landw. Jahrb., 46 (1914), No. 3, pp. 343-365*).—In studies made of the effect of Swedish turnips, carrot leaves, shives, kohlrabi leaves, grass, hay, straw, beets, cabbages, and other feeds upon the flavor of butter it was found that changes in flavor were in part due to the taste and odor of the feeds, and in part to bacteria found on these feeds which generate new flavors. While it is probable that each group or type of bacteria has a specific action in producing taste and odor, it is not certain if the same feed medium will produce the same taste and odor with different types of bacteria.

[Milk fat tables], L. U. HELLER (*Chicago, 1914, pp. 170*).—Tables are given for determining the milk fat in cans of cream and the value thereof. They cover a range in the test of cream from 15 to 54.5 per cent, and a range of price of fat from 20 to 40.5 cts. per pound.

VETERINARY MEDICINE.

Infection and resistance, H. ZINSSER (*New York, 1914, pp. XIII+546, figs. 44*).—This book constitutes an exposition of the biological phenomena underlying the occurrence of infection and the recovery of the animal body from infectious disease. A chapter on colloids and colloidal reactions, by S. W. Young, is appended.

Defensive ferments of the animal organism, E. ABDERHALDEN, trans. by J. O. GAVRONSKY and W. F. LANCHESTER (*London, 1914, pp. XX+242, pl. 1, figs. 11*).—This is a translation of the third German edition (E. S. R., 31, p. 278).

Results of research in the general pathology and pathologic anatomy of man and animals, edited by O. LUBARSCH and R. VON OSTERTAG (*Ergeb. Allg. Path. Mensch. u. Tiere, 17 (1913), pt. 1, pp. VIII+951, pl. 1, figs. 27*).—The contents of this volume are as follows: Lympho- and Leucocytosis, by K. Helly (pp. 1-136); The Study of General and Local Eosinophilia, by E.

Schwarz (pp. 137-789); The Biology and Pathological Action of Light, by F. Bering (pp. 790-858); and The General Pathology and Pathologic Anatomy of the Teeth and the Buccal Cavity, by G. Blessing (pp. 859-912). A large bibliography is included in each case.

First International Congress of Comparative Pathology (*1. Cong. Internat. Pathol. Comparée* [Paris], 1912, vol. 1, Raps., pp. 792, pls. 3, figs. 64).—Among the papers here presented that are of interest to the veterinarian are the following:

Tuberculous Animals and the Part They Play in the Infection of Man, by A. Calmette (pp. 1-6), previously noted from another source (E. S. R., 29, p. 382); Dangers to Man from the Tuberculous Bovine, by J. Lignières (pp. 26-30); Avian Diphtheria and Human Diphtheria, by F. Arloing (pp. 31-95); Human and Avian Diphtheria, by Rappin (pp. 95-120); Meningo-encephalitis in Comparative Pathology—"General Paralysis" of the Dog, by L. Marchand and G. Petit (pp. 123-130); Report on Rabies, by Remlinger (pp. 149-178) and by V. Babes (pp. 179-189); The Etiology and Diagnosis of Rabies, by Mme. Luzzani Negri (pp. 189-210, 744-782); The *Micrococcus melitensis* in France, by C. Dubois (pp. 211-234); Variola and Vaccine, by Chaumier (pp. 333-361); Alveolar Echinococcosis and Hydatid Echinococcosis, by F. Dévé (pp. 363-426); Measles of Domestic Animals and Their Relation to Human Tæniasis, by C. Morot (pp. 426-453); The Problem of Fungus Parasites of Man and Animals in 1912, by E. Bodin (pp. 453-499); Verminous Toxins, by M. Weinberg (pp. 653-677), previously noted (E. S. R., 30, p. 278); Latent Viruses or Durable Germs and Epidemic Diseases, by E. Perroncito (pp. 678-688); and Comparative Pathology of the Sporotrichoses of Animals, by De Beurmann and Gougeot (pp. 688-719), previously noted (E. S. R., 30, p. 282).

A number of the papers include extensive bibliographies.

Veterinary science, C. M. HARING (*California Sta. Rpt. 1914*, pp. 157-179, figs. 7).—Several papers are presented which report upon the work of the year, including a discussion of Tuberculosis in Farm Animals (pp. 157-160), The Prevention of Hog Cholera, by J. F. Mitchell and W. J. Taylor (pp. 161-168), Miscellaneous Investigations Concerning Hog Cholera (pp. 169, 170) and The Activities of the Veterinary Division at the University Farm (pp. 171-177), by F. M. Hayes, and Activities of the Veterinary Division in Southern California, by W. J. Taylor (pp. 178, 179).

The conclusions drawn by F. M. Hayes from bacterial studies of antihog-cholera serum are as follows: "Practically all antihog-cholera sera contain living bacteria. California serum showed the lowest bacterial count. A species of streptococci predominated in all sera examined. Hyperimmunes do not give off bacteria in their blood. Organisms enter the serum during the process of defibrination and bottling. Squeezing the serum from the clot by the hand contaminates the serum to a greater extent than the use of some form of sterilized press. It is possible for organisms to multiply in serum preserved in 0.5 per cent carbolic acid. Very little difference in the number of bacteria in the state and commercial sera examined [was found]. State and commercial sera are about equal in potency. A high bacterial count does not necessarily predispose to abscesses." He failed to find spirochetes in the blood of twelve cholera-infected hogs.

Annual report for 1913 of the principal of the Royal Veterinary College, J. McFADYEAN (*Jour. Roy. Agr. Soc. England*, 74 (1913), pp. 346-358).—In this annual report the author discusses the occurrence of and work against glanders, foot-and-mouth disease, sheep scab, parasitic mange, hog cholera, and tuberculosis.

Annual report of the Civil Veterinary Department, Bihar and Orissa, for the year 1913-14, D. QUINLAN (*Ann. Rpt. Civ. Vet. Dept. Bihar and Orissa, 1913-14*, pp. 5+8+XI+2).—This, the usual annual report, deals with veterinary instruction, the occurrence of contagious diseases of animals and their treatment, preventive inoculation, breeding operations, etc.

Annual report on the Punjab Veterinary College, Civil Veterinary Department, Punjab, and the Government Cattle Farm, Hissar, for the year 1913-14, PEASE, J. FARMER, and R. BRANFORD (*Ann. Rpt. Punjab. Vet. Col. and Civ. Vet. Dept., 1913-14*, pp. III+2+17+XVII).—This is the usual annual report dealing with the occurrence and treatment of contagious diseases of domestic animals, breeding operations, etc.

On metallic colloids and their bactericidal properties, H. CROOKES (*Chem. News*, 109 (1914), No. 2841, pp. 217-219, figs. 2; *Sci. Amer. Sup.*, 78 (1914), No. 2009, pp. 2, 3, fig. 1).—The colloids differ from radium in that they do not burn the flesh but exert a bland and soothing effect on the animal tissues and kill the bacteria. These preparations are stable, harmless liquids containing metallic particles in suspension which exhibit the Brownian movement.

Infusion apparatus for administering artificial sera, etc., W. GOTTSCHALK (*Berlin. Tierärztl. Wchnschr.*, 30 (1914), No. 6, p. 93, fig. 1).—A description of an apparatus for the subcutaneous administration of large amounts of medicinal agents such as physiological salt solution.

The technique of the Wassermann reaction, with special reference to the use of antigens containing cholesterol, C. H. BROWNING (*Lancet [London]*, 1914, I, No. 11, pp. 740-742).—This has special reference to the use of antigens containing cholesterol for the complement fixation test.

About some tests with antistreptococcic serum, PERL (*Berlin. Tierärztl. Wchnschr.*, 30 (1914), No. 6, pp. 91-93).—Experiments with Schreiber's serum, which is obtained by treating horses with cultures of streptococci from cases of mastitis (bovines), infected wounds (horses), and also from lame patients, led the author to ask whether it would not be more rational to use a serum prepared from the streptococcus causing the disease and not a polyvalent serum. Eighteen cases, which included mastitis in cows, acute pneumonia (possibly affected with strangles), phlegmons on an extremity, polyarthritis in suckling foals, morbus maculosus, arthritis of the fetlock joint (due to stepping on a nail), lacerated cervix in a mare, bronchopneumonia and bilateral pneumonia in horses suspected of having strangles, strangles in a foal, and a swollen extremity in a cow, were treated by this method.

No definite conclusions are drawn except that the intravenous method of administration seems to be the most feasible, but that a special apparatus must be devised for the purpose. The doses of the serum were also too small.

Ultravisible virus, LOEFFLER (*Berlin. Tierärztl. Wchnschr.*, 30 (1914), Nos. 12, Beilage, pp. 15, 16; 13, Beilage, pp. 17-19).—A lecture delivered at the thirteenth general meeting of the official Prussian veterinarians in Berlin, December 6, 1913. It mentions the diseases caused by filterable viruses and discusses the findings in this field chronologically.

Interesting cases of anaphylaxis, V. BALLA (*Állatorvosi Lapok*, 36 (1913), No. 46, pp. 547-549; *abs. in Berlin. Tierärztl. Wchnschr.*, 30 (1914), No. 6, p. 97).—In a barn in which five months previously animals were vaccinated against anthrax with Pasteur's vaccine (I and II), death occurred amongst the animals. Serum treatment was given and no new cases occurred. Nine months later a newly-imported but not vaccinated animal died from anthrax and the other animals in the barn received injections of 10 cc. of serum as before. This resulted in the production of typical anaphylactic symptoms.

When anthrax is suspected the author recommends giving 40 cc. of serum subcutaneously, or 30 cc. intravenously, and also including those animals which have previously been vaccinated with serum. The use of Sobernheim's antitoxin (prepared with horses) the second time is discouraged.

Aphthous fever or foot-and-mouth disease, C. J. MARSHALL (*Penn. Live Stock Sanit. Bd. Circ. 15* [rev. ed.] (1914), pp. 26).—A summarized account of this disease and its occurrence in Pennsylvania at the time of publication.

East Coast fever, W. ROBERTSON (*Union So. Africa Dept. Agr. Rpt. 1912-13*, pp. 135, 136).—About 159,000 head of cattle were immunized against East Coast fever during 1912. The practical outcome of these investigations is summarized as follows:

"The experience in the field indicates that the inoculation can safely be undertaken in respect of either clean or infected cattle with the prospect of conferring immunity on from 56 to 60 per cent.

"The best results in the field may be expected by the injection of 5 cc. spleen and gland pulp (medium, half coarse, or coarse grain, mixed with peptone or aleuronat, such animals to be kept on clean veld for 14 or 15 days before they are exposed to natural infection.

"The immunity conferred by the injection may not be absolute, inasmuch as 12 breakdowns were noted amongst the experimental animals, or 1 per cent.

"The animal which supplied the spleen and gland pulp for the injection has apparently an influence on the results, as the variation in mortality from the injection can not be considered to be due to any other factor.

"As a possible improvement to the present method of immunizing cattle against East Coast fever, the saturation of the pulp in a solution of quinin hydrochlorid is suggested, the strength of the solution to be between 0.6 per cent and 0.7 per cent."

Johne's disease, F. W. TWORT and G. L. Y. INGRAM (*London, 1913*, pp. VI+178, pls. 9; rev. in *Vet. Jour.*, 69 (1913), No. 459, p. 445).—The authors summarize the present status of the knowledge of this disease. The first five chapters deal with the history of the disease, its importance to stock owners and breeders, its clinical features, methods of diagnosis and treatment, and the pathological lesions found post-mortem.

The trypanblue treatment in piroplasmosis of domesticated animals in South Africa, A. GOODALL (*Parasitology*, 7 (1914), No. 1, pp. 62-68).—The author reports upon a number of cases of piroplasmosis treated with trypanblue, including biliary fever of dogs due to *Piroplasma canis*, equine piroplasmosis due to *Nuttallia equi*, piroplasmosis of donkeys due to *P. caballi?*, and South African redwater in cattle due to *P. bigeminum*. The general conclusions drawn from these studies are as follows:

"Parasites are not always present in the peripheral blood of dogs, and are often extremely difficult to find in other animals, especially under conditions encountered in the field. If well-marked clinical symptoms are shown one is justified in using trypanblue, even if parasites can not be satisfactorily demonstrated. A large dose of a weak solution of trypanblue should be administered. The writer can not help thinking that the failures attributed to the drug by other observers are due, in many cases, to too small a quantity of the solution being injected. After an experience of the treatment in some hundreds of cases, the writer feels justified in stating that animals do not suffer from relapses if a sufficient quantity of the solution is used. The dog can become infected a second time after trypanblue treatment, but this second infection is also amenable to the drug."

Serum therapy in tetanus, G. THEISZ (*Allatorvosi Lapok*, 36 (1913), No. 34, pp. 403-405; *abs. in Berlin. Tierärztl. Wchnschr.*, 30 (1914), No. 12, p. 204).—Tetanus antitoxin is usually recommended only as a preventive, but the author used it as a curative with good results. Large doses are necessary, however.

"Tick paralysis" in man and animals, G. H. F. NUTTALL (*Parasitology*, 7 (1914), No. 1, pp. 95-104).—The author reviews and comments upon published records of tick paralysis which have come to his attention since the publication of the previous paper (*E. S. R.*, 30, p. 182).

The arsenical dip and its value in combating ticks and tick-transmitted diseases, A. THEILER (*Ztschr. Infektionskrank. u. Hyg. Haustiere*, 16 (1914), No. 1-2, pp. 1-26, figs. 3).—This article is based upon investigations and observations of the author in South Africa.

Ferment-inhibiting substances in tubercle bacilli.—Studies on ferment action, XI, J. W. JOBLING and W. PETERSEN (*Jour. Expt. Med.*, 19 (1914), No. 3, pp. 251-258, figs. 4).—Much work has been done in an attempt to explain the processes that lead to the production of caseation in tuberculosis. Some have ascribed it to anemia, the tubercle being avascular, and others to the action of toxins derived from the tubercle bacilli.

This work shows that tubercle bacilli contain ferment-inhibiting substances, which "brings us one step nearer a rational explanation of caseation in tuberculosis. Tubercle bacilli contain unsaturated fatty acids which, when saponified, have the property of inhibiting the action of trypsin and leucoprotease. In proportion to their iodine value these soaps are more active as inhibiting agents than the soaps prepared from linseed, olive, and cod liver oils. The activity of the soaps is dependent on the presence of unsaturated carbon bonds. Saturation of the soaps with iodine destroys their inhibiting action. Soaps probably play an important part in the production of the condition known as caseation in tuberculosis."

A study of the ferments and ferment-inhibiting substances in tuberculous caseous material.—Studies on ferment action, XII, J. W. JOBLING and W. PETERSEN (*Jour. Expt. Med.*, 19 (1914), No. 4, pp. 383-397, figs. 6).—Continuing work noted above it is now shown that "caseous matter obtained from lymph glands which have not become secondarily infected contains substances which inhibit enzym activity. These substances consist chiefly of soaps of the unsaturated fatty acids. The inhibiting substances are present in relatively smaller amounts when the caseous matter has become secondarily infected. This is probably due to the dilution and washing out of the soaps. Ferments are either entirely absent or present in very small amounts, unless the caseous matter has become secondarily infected.

"Caseous material from the lungs contains smaller amounts of the inhibiting substances. This may be due to the acuteness of the process, which does not permit an accumulation of the soaps, or to the binding of the soaps with the ferments. Ferments are present in caseous pneumonia. In the whole emulsion the ferments are less active in an alkaline than in an acid reaction; but removal of the soaps shows that those active in an alkaline reaction are also present in considerable amounts. The previous treatment with iodine of caseous matter from both lymph glands and lungs increases the action of the trypsin."

The methods employed for experimental tuberculosis by inhalation, P. CHAUSSEÉ (*Rec. Méd. Vét.*, 90 (1913), No. 14, pp. 267-274, fig. 1).—A discussion of methods, but more especially the one utilized by the author, with a description of the apparatus employed. The advantages of using good technique for realizing a tuberculosis by inhalation are emphasized.

An attempt to immunize guinea pigs against tuberculosis by the use of graduated, repeated doses of living tubercle bacilli, L. BROWN, F. H. HEISE, and S. A. PETROFF (*Jour. Med. Research*, 30 (1914), No. 3, pp. 475-485).—The experiments show that repeated doses of even virulent tubercle bacilli prolong the life of the animal far beyond that of the controls. The probable explanation lies in the fact that the superinfection may be held in check for a time by the presence of a slight, active tuberculous focus. "It is very probable from the autopsy findings that all of the treated guinea pigs would have eventually died from chronic tuberculosis."

What has been done with the tuberculin test in Wisconsin, E. G. HASTINGS (*Wisconsin Sta. Bul.* 243 (1914), pp. 3-24, fig. 1).—This is a discussion of the results achieved by the State of Wisconsin in the eradicating of tuberculosis on the basis of the tuberculin test, especially when carried out by the non-professional tester. The figures given are taken from the records of the State Live Stock Sanitary Board, and continue work previously noted (E. S. R. 21, p. 384).

Wisconsin is the only State, as far as the author's knowledge goes, in which the funds for compensation are not limited. The number of voluntary tests made in 1901 was 425 and in 1908, 40,995. The first compulsory law requiring that only healthy animals should be sold was enforced in the State for six months, i. e., from December, 1910, to June, 1911. The law was repealed.

"With the advent of general testing, 1907-8, the percentage of reacting animals declined to 8.1 per cent. The results obtained in subsequent years showed a constant decline to 1911-12. The lowest mark was reached in 1910-11, when 200,000 cattle were tested, of which it is estimated that 3 per cent reacted. It is believed that the results obtained during the last three years indicate an actual decrease in the percentage of tubercular animals in the State. This belief is strengthened by the fact that during 1911-12 the testing was less general than during the two previous years. In spite of this fact, the percentage of reacting animals was lower than in any previous year except 1910-11, when the testing was widespread. It is certain that not over 5 per cent of the dairy cattle of the State are tubercular, and possibly not over 4 per cent. It is probable that the percentage of diseased animals is lower than in any other of the great dairy States."

No data are given regarding the percentage of diseased herds but it is said not to be in excess of 25 per cent. The larger part of the reacting animals were turned over to the State as provided by law. The percentage of reacting animals condemned in 1906-7 was 48, and in 1911-12, 28.7 per cent. The net return to the State was variable. "The average return was \$18.88 per carcass. The net returns in Wisconsin for the two years, 1910-11 and 1911-12, were \$14.21 and \$12.90 per head. This is after all freight and killing charges have been paid. . . . For the 6-year period, 1906-1912, the amount received by the State for the passed meat has amounted to 34.7 per cent of the amount paid by the State to the owners of tubercular cattle."

The question of compensation, cost of eliminating reacting animals, and the advantages to be gained by the early recognition of reactors are discussed. In addition, the basis of compensation by the State, considerations in determining the value of animals, and the manner of applying the tuberculin test in Wisconsin are gone into. The policy of nonprofessional testing was adopted because it was considered of the greatest importance to the live stock industry of the State to have the widest possible use of the test.

The records of testing in Wisconsin differ from those obtained in other States inasmuch as fewer of the reacting cattle are found to have lesions. "It

is evident from the data that there is no essential difference between the records of the two groups of testers, [professional and nonprofessional], and that those are in error who have claimed that the apparently less satisfactory results obtained in this State with the tuberculin test, so far as the occurrence of animals that failed to show lesions on slaughter is concerned, have been due to the nonprofessional testing." The percentage of animals that do not show lesions on slaughter increases with the more general application of the test, "or, in other words, with the testing of what represents the average herd of the State, rather than when a considerable portion of the animals tested are from badly infected herds. Thus, in the year 1910-11, when over 200,000 animals were tested, the effect of the nonprofessional testing was to increase the percentage of no-lesion animals from 20.6 per cent, the record of the veterinarians, to 21.8 per cent. During this year 44.5 per cent of all testing was done by nonprofessional men. It is clear that the cause of the large percentage of no-lesion animals is not to be found in the way in which the test has been handled in Wisconsin, but that the explanation must be sought elsewhere."

A study was also made to determine whether there was any essential difference between the temperatures of the animals showing lesions and those having no lesions. "The no-lesion animals as a class tend to have lower temperatures after injection of the tuberculin than do those animals that show lesions of tuberculosis on slaughter. It is again clear that no accurate division of the lesion and no-lesion animals can be made by aid of the temperature records alone."

The agglutination of *Micrococcus melitensis* by normal cows' milk, P. W. BASSETT-SMITH (*Lancet* [London], 1914, I, No. 11, pp. 737-739).—"Using a 48 hours' culture for the emulsion and a dilution of 1:20 in this series, none of the milk from 21 cows gave a positive reaction when examined quite fresh, but with mixed samples of milk a high proportion reacted positively at this dilution, most of which were cut out by using heated milk and diluting with distilled water instead of saline solution. In any case it is very necessary to centrifuge the milk very thoroughly and to examine it at once, using an emulsion made from the *M. melitensis* not more than 48 hours old, and even then a few errors will occur by false clumps in the sedimentation tubes carrying down micrococci with them.

"There is no doubt that cows' milk in some cases has a natural tendency to agglutinate the *M. melitensis*, but if care is taken most of these nonspecific reactions may be avoided. The reaction always requires to be controlled by other methods of diagnosis before an animal can be considered to be infected."

See also previous notes (E. S. R., 27, 380; 29, p. 780).

Loco weed disease of sheep, H. T. MARSHALL (*Univ. Va., Bul. Phil. Soc., Sci. Ser.*, 1 (1914), No. 19, pp. 373-436).—This is a detailed report of investigations conducted in Montana in 1903 and 1904, particularly as relate to the symptoms and to the anatomical changes characteristic of loco weed poisoning, a summary of which has previously been noted from another source (E. S. R., 31, p. 781). The subject is reported under the headings of information obtained from the ranchmen and from the literature (pp. 375-380), examinations of "locoed" sheep (pp. 380-399), feeding experiments (pp. 400-420), discussion of parasitic diseases encountered (pp. 421-423), review of recent publications dealing with loco weed disease (pp. 423-433), and the loco problem (pp. 433-436).

Investigation into the disease of sheep called "scrapie" (Traberkrankheit; la tremblante), with especial reference to its association with sarco-sporidiosis, J. P. M'GOWAN (*Edinburgh, 1914, pp. VI+116, pls. 14*).—The

several chapters of this work deal with the history of the disease in Britain; the disease as it occurs in other countries of Europe, and especially in Germany and France; symptoms and pathology of the disease; account of a case of scrapie seen in Germany; the structure and possible developmental stages of the sarcocyst and their relation to the spread of the disease; symptoms exhibited by animals heavily infected with sarcosporidia; the action of the sarcocystin, the toxin produced by the sarcocyst; the mode of spread of sarcosporidiosis from animal to animal in carnivorous animals; method of spread of sarcosporidiosis in graminivorous animals; observations as to the presence of sarcocysts in the muscles of apparently healthy sheep; and epizootiology.

In conclusion the author states that he believes scrapie to be caused by a heavy infection with sarcosporidia. This heavy infection appears to be brought about by the system of breeding in vogue in the regions where scrapie is in evidence, namely, the keeping up of the ewe stock by means of the ewe lambs derived from the 2-year-old ewes, this being the age period at which scrapie occurs most abundantly, and which results in the heavily infected mothers passing on a heavy infection to their progeny. He has obtained no evidence, epizootiological or pathological, that the disease is spread by the ram.

Among the considerations that have led the author to conclude that scrapie is due to a heavy infection with sarcosporidia are the following: The sarcocyst is always present in the skeletal muscles of scrapie sheep in large numbers, and the more advanced the case the larger is the number of the sarcocysts present. Pruritus (or itching), the chief symptom in scrapie, can be reproduced in rabbits by the injection into them of sarcosporidial emulsions. Careful clinical examination of typical cases makes it highly probable that the parietic phenomena of the disease are due to a primary muscle lesion. There is an absence of any condition of post-mortem, except extensive sarcosporidiosis, sufficient to or of a nature likely to cause the phenomena observed in the disease, and no single view can explain so well the symptomatology and epizootiology, etc., of the disease as this.

Treatment of the disease appears to be useless and the author recommends that the affected animal be sent to the butcher at once before the sarcocysts have become very numerous and the animal emaciated, that the ewe stock be kept up from the progeny of the older ewes, and that the progeny of the 2-year-old ewes, and possibly of the two-crop ewes, be sent to the butcher. Diseased animals should at once be killed to prevent any possibility of their being used as breeding stock.

In an appendix reference is made to a report^a and a paper (E. S. R., 30, p. 783) by Stockman relating to the subject, and to the work on John's disease by Twort and Ingram noted on page 273.

A glossary of terms is appended.

Diseases of swine with particular reference to hog cholera, C. F. LYNCH (*Philadelphia and London, 1914, pp. 741, figs. 120*).—This work deals especially with hog cholera and the manufacture and use of antihog-cholera serum.

In the first part of the work (pp. 17–83) the author discusses the various breeds of swine. Under the headings of infectious diseases of swine, he first takes up hog cholera (pp. 84–510) at considerable length, and then briefly considers the other infectious diseases (pp. 511–534). Discussions of diseases of the digestive tract, respiratory tract, kidney and bladder, heart, skin, nervous system, organs of locomotion, organs of generation, parasitic diseases, and surgical diseases (pp. 535–709) follow.

A chapter on castration by G. R. White (pp. 710–728) is appended.

^a Bd. Agr. and Fisheries [London], [Vet. Dept.] Ann. Rpts. Proc. 1909, p. 22.

The hog cholera situation in Michigan (*Michigan Sta. Circ.* 22 (1914), pp. 145-148).—A popular statement. See also a previous note (E. S. R., 31, p. 585).

The surgical anatomy of the horse, J. T. SHARE-JONES (*London*, 1914, pt. 4, pp. X+259, pls. 22).—This fourth part of the work previously noted (E. S. R., 24, p. 684) deals with the foot and trunk.

Narcosis by chloral hydrate in horses, H. FRIIS (*Maanedskr. Dyrlæger*, 26 (1914), No. 4, pp. 97-113; abs. in *Vet. Rec.*, 26 (1914), No. 1355, pp. 832, 833).—A discussion of the dosage, administration, and effect of chloral hydrate, in which the author considers its advantages in veterinary practice over chloroform, ether, and morphia.

Poisoning of horses by ground ivy (*Glechoma hederacea*), J. FERENCZHÁZY (*Állatorvosi Lapok*, 37 (1914), No. 8, pp. 89, 90; abs. in *Berlin. Tierärztl. Wchnschr.*, 30 (1914), No. 15, p. 259).—A report of nine cases of poisoning in horses by this plant. It was found to have no detrimental effect on bovines or sheep. The toxic symptoms noted in horses were anemic appearance, dyspnea, salivation, perspiration, dilation of pupils, cyanosis, and edema of the lungs. The treatment administered consisted of venesection, injections of camphor, and the giving of castor oil, followed by tannic acid in mucilage. Only two of the animals died.

The results of eating St. John's wort noted in horses, HENRY (*Bul. Soc. Cent. Méd. Vét.*, 90 (1913), No. 24, pp. 459-465; abs. in *Berlin. Tierärztl. Wchnschr.*, 30 (1914), No. 15, p. 259).—Horses eating hay contaminated with St. John's wort (*Hypericum perforatum*) showed exanthema in the mares and on the nonpigmented portions of the forehead and on the lips. Intense itching and marked salivation were also present. In the blossoms, hulls, and in the seeds of St. John's wort a blood-red coloring matter is present (hyperizin or hypericum red). The solution in a thin layer has a high blood-red fluorescence, which acts upon the nonpigmented skin through the aid of the sun's rays.

Equine biliary fever in Madras, J. F. VALLADARES (*Parasitology*, 7 (1914), No. 1, pp. 88-94).—Both *Nuttallia equi* and *Piroplasma caballi* occur in equine biliary fever in India, giving rise to two distinct diseases in the Madras Presidency. The infection is more prevalent among Australian horses. Both forms are amenable to treatment, if diagnosed at an early stage, but nuttalliosis may persist and is liable to recurrence when the infected animal is subjected to unfavorable conditions.

Note on the treatment of biliary fever of the horse with trypanblue, L. E. W. BEVAN (*Rhodesia Agr. Jour.*, 11 (1914), No. 5, pp. 735, 736, pl. 1).—The author states that the results obtained from the treatment of the case here reported and of others in the field have led him to the opinion that trypanblue exerts no beneficial effect, in the horse, and it may even prove harmful.

The more recent conceptions of pectoral influenza of the horse, P. HAAN (*Rev. Gén. Méd. Vét.*, 23 (1914), No. 272, pp. 409-416; abs. in *Vet. Rec.*, 27 (1914), No. 1365, pp. 153-155).—This is a brief review of the recent work of Gaffky and Lührs, previously noted (E. S. R., 31, p. 382).

Modification of diet saves ducklings from epidemic disease, P. MERKLEN (*Bul. Soc. Pédiatrie Paris*, 16 (1914), No. 4, pp. 197, 198; abs. in *Jour. Amer. Med. Assoc.*, 62 (1914), No. 25, p. 1996).—The disease referred to is called "the cramp" and affects ducklings from three to four weeks old. "A number of cases having occurred on a farm near Paris, [the author] had the feed changed to a greater variety, and no further cases developed. A return to the former monotonous diet was speedily followed by development of new cases, and the epidemic subsided again when the mixed feed was resumed."

Transmission of Spirochæta gallinarum by mites, M. MAYER (*Arch. Schiffs u. Tropen Hyg.*, 18 (1914), No. 7, pp. 254, 255; *abs. in Bul. Inst. Pasteur*, 12 (1914), No. 10, p. 442).—At the Hamburg Institute of Tropical Diseases where a spirochete virus is preserved in canaries the disease has often been observed to spread from cage to cage. Investigations have led to the conclusion that mites (*Dermanyssus* sp.) may at times be agents by which the disease is spread.

RURAL ENGINEERING.

Irrigation investigations, F. ADAMS (*California Sta. Rpt.* 1914, pp. 124-127, figs. 2).—Irrigation experiments in 1913, carried on in cooperation with this Office and the State Department of Engineering, show that up to a certain point crop yields increase quite consistently with increasing amounts of irrigation water, after which in some cases they decrease. Soil moisture determinations made before and after irrigations indicate the care which is desirable in the use of water, and show that a large part of the water applied, even under what are generally considered good methods of practice, percolates below the zone of observation which, except with alfalfa, is usually the chief zone of root growth.

Profile surveys in the basin of Clark Fork of Columbia River, Montana-Idaho-Washington, R. B. MARSHALL ET AL. (*U. S. Geol. Survey, Water-Supply Paper 346* (1914), pp. 6, pls. 22).—A number of profile maps of these surveys are given.

Profile surveys in Snake River Basin, Idaho, R. B. MARSHALL ET AL. (*U. S. Geol. Survey, Water-Supply Paper 347* (1914), pp. 12, pls. 37).—This report describes the general features of the Snake River Basin and gives a large number of profile surveys made in the basin.

The Snake River Basin is said to have many feasible storage sites, few of which have been developed. "Irrigation has reached a high stage of development in the Snake River Valley, yet approximately 6,000,000 acre-feet of water annually runs to waste. Eventually these flood waters will be stored and used to irrigate thousands of acres of arid land."

Surface water supply of Colorado River Basin, R. FOLLANSBEE, E. A. PORTER, and H. D. PADGETT (*U. S. Geol. Survey, Water-Supply Paper 329* (1914), pp. 238, pls. 2).—This report presents the results of measurements of flow made on the Green and main Colorado Rivers, New Fork River, Big Sandy Creek, Yampa River, Ashley Creek, Duchesne River, White River, Price River, San Rafael River, Grand River, Dolores River, Fremont River, Escalante River, San Juan River, Virgin River, Bill Williams River, and Gila River basins in 1912. Tables give daily gage heights and daily and monthly discharges at each station.

Surface water supply of the Missouri River Basin, 1912, W. A. LAMB, R. FOLLANSBEE, and H. D. PADGETT (*U. S. Geol. Survey, Water-Supply Paper 326* (1914), pp. 375, pls. 2).—This report presents the results of measurements of flow made on the Missouri River and its tributaries during 1912. Daily gage heights and daily and monthly discharges are given for each station.

Deschutes River, Oregon, and its utilization, F. F. HENSHAW, J. H. LEWIS, and E. J. MCCAUSTLAND (*U. S. Geol. Survey, Water-Supply Paper 344* (1914), pp. 200, pls. 43, figs. 8).—This report, prepared in cooperation with the State of Oregon, describes the general features of the Deschutes River Basin, presents the results of measurements of stream flow made in the basin, and deals in more or less detail with such related subjects as economic distribution of water, quality and availability of the water supply, developed and undevel-

oped power sites in the basin, water rights and appropriations, the relation of the Federal Government to the development of water power in the basin, and government permits for power and reservoir sites.

"From information now in hand it appears that more than 600,000 horsepower can be developed and that approximately 500,000 acres of arid land can ultimately be irrigated from Deschutes River and its tributaries. . . . The irrigable lands . . . are so situated on a plateau in the upper part of the basin that the total flow of the upper river and its principal tributaries may be utilized for irrigation; and below the irrigable area the river flows in a deep canyon having a fair slope and affording excellent opportunities for power development. . . . If the development of this stream is left to private capital without public consideration of the effect of each new project on the comprehensive plan for the development of the valley as a whole enormous waste may take place before the highest use of these waters is attained. . . . Extensive storage to supplement the flow of water in the lower river for power should not be permitted on Deschutes River above Bend but should be confined to Crooked River, from which stream the diversion of water for irrigation is more difficult. With this exception, all the water in the upper two-thirds of Deschutes River Basin should be reserved for irrigation."

Quality of the surface waters of Oregon, W. VAN WINKLE (*U. S. Geol. Survey, Water-Supply Paper 363 (1914), pp. 137, pls. 2, fig. 1*).—This paper describes the natural and economic features of Oregon and reports a cooperative survey between the U. S. Geological Survey and the State of Oregon to determine the chemical composition of the waters of the State.

A summary of the survey indicates that the river waters of Oregon are low in mineral content and are very good for general industrial use and for irrigation. With one or two exceptions they carry small amounts of suspended matter that can be readily removed. "The waters of John Day and Sandy Rivers, however, are characterized by very finely comminuted suspended matter, the removal of which would be difficult and would probably necessitate filtration through rapid filters. Slow sand filtration can be used with many of the river waters, but coagulation and rapid filtration is better suited to some of them.

"Erosion progresses most rapidly in the upper basin of John Day River, where it is chiefly by corrasion, somewhat less rapidly in the Coast Range, still less in the Cascades, and most slowly in the central part of the State.

"The lakes of central Oregon are large and the waters of some of them are economically important. Detailed studies should be made of the deposits and brines in order to ascertain the location, nature, extent, and commercial value of the residue."

The water supply of Indiana (*Ann. Rpt. Ind. Bd. Health, 31 (1912), pp. 533-541, figs. 4*).—Data are given of examinations of 217 public water supplies and 947 private water supplies in the State in 1912.

Of the public supplies 66 were streams, 63 deep wells, 42 ponds, 29 shallow wells, and 17 springs. Of the 66 streams examined the waters of 36 were good, of 10 bad, and of 20 doubtful. Of the 63 deep wells examined 57 were good, 1 bad, and 6 doubtful. Of the 42 ponds examined the waters of 26 were good, of 6 bad, and of 10 doubtful. Of the 29 shallow wells examined the waters of 21 were good, of 3 bad, and of 5 doubtful. Of 17 springs the waters of 10 were good, of 1 bad, and of 6 doubtful.

The private supplies consisted of 587 shallow wells, 271 deep wells, 42 springs, 31 cisterns, and 16 miscellaneous. Of the shallow wells examined the waters of 254 were good, of 246 bad, and of 87 doubtful. Of the deep wells examined

the waters of 207 were good, of 26 bad, and of 38 doubtful. Of the springs examined the waters of 26 were good, of 5 bad, and of 11 doubtful. Of the cisterns examined the waters of 22 were good, of 6 bad, and of 9 doubtful.

Water analyses from the laboratory of the United States Geological Survey, F. W. CLARKE (*U. S. Geol. Survey, Water-Supply Paper 364 (1914), pp. 40*).—This paper contains 203 water analyses, most of which have been published elsewhere.

The farm water supply, H. C. RAMSOWER (*Farm Engin., 2 (1914), No. 3, pp. 50, 51, figs. 4*).—In discussing power for pumping farm water the author is of the opinion that for the average farm the windmill will, in the long run, afford a cheaper and more satisfactory pumping power than the gas engine. He prefers the steel wheel and tower and states that a back-geared mill should be used in windy sections and a direct-geared mill in less windy sections. A 12 ft. wheel is considered to be the largest practical size to use.

Results of tests on stationary gas engines (*Gas Engine, 16 (1914), No. 9, pp. 548-551*).—The results of tests of 7 stationary farm gas engines are reported in tabular form, giving in addition complete data of dimensions of parts, methods of governing, ignition, oiling, cooling, etc. Five engines were tested on gasoline, 1 on kerosene, and 1, a 2-cycle engine, on distillate.

Out of a possible total of 500 points rated according to economy, general operation, design, and construction, the kerosene engine, rated at 6 horsepower, made the highest score of 451.5 points. The following scores were made by the gasoline engines: 7 horsepower, 411.9; 5 horsepower, 406.5; 6 horsepower, 385.3; 4 horsepower, 383.9; and 8 horsepower, 332.5.

The more important test results are summarized in the following table:

Summary of gas engine tests.

Rated horsepower.	Kind of fuel used.	Feed grinder test of 60 minutes.			No load test.		120-minute economy brake test.			30-minute maximum brake horsepower test.		
		Amount of fuel used.	Weight of barley ground.	Cost of fuel per 100 pounds feed.	Fuel used per hour.	Cost per rated horsepower for 10 hours.	Fuel used.	Horsepower hours per gallon of fuel.	Cost of fuel per horsepower for 10 hours.	Fuel used.	Average brake horsepower developed.	Cost of fuel per brake horsepower hour.
		<i>Lbs.</i>	<i>Lbs.</i>	<i>Cts.</i>	<i>Lbs.</i>	<i>Cts.</i>	<i>Lbs.</i>		<i>Cts.</i>	<i>Lbs.</i>		<i>Cts.</i>
6	Gasoline..	4.10	723.0	1.65	0.6	2.90	10.90	7.88	26.6	2.7	6.46	2.43
7	.....	4.60	1,010.0	1.33	1.0	4.16	9.10	9.70	21.6	3.5	7.75	2.63
8	.....	9.95	560.0	5.18	2.0	7.29	12.30	8.19	25.6	3.3	7.86	2.45
5	.....	4.25	720.0	1.72	1.6	9.33	6.70	8.55	24.6	2.6	5.80	2.60
4	.....	2.60	441.0	1.76	1.2	8.75	5.25	9.31	22.4	3.4	3.95	5.02
6	Kerosene..	5.45	1,106.0	.99	1.8	6.00	9.10	10.54	15.1	3.0	7.58	1.59
6	Distillate..	2.85	441.5	1.25	5.0	16.10	12.70	7.42	20.4	6.6	6.59	4.31

The theory of the plow mold board, R. BERNSTEIN (*Kühn Arch., 5 (1914), pp. 169-189, figs. 11*).—The author discusses mathematically and graphically the development of the plow mold board, dealing mainly with the action in soil of both the curved and the so-called cylindrical mold board.

Results of motor plow demonstrations and tests, B. MARTINY (*Kühn Arch., 5 (1914), pp. 111-126*).—The author reviews the results of several motor plowing contests, held in Germany, for the purpose of showing how the operating characteristics of several of the better-known motor plow systems are affected by the conditions of a motor plow demonstration. The main points considered are steering, uniformity and completeness of the plowing, soil com-

pression, and the sliding and sinking of the drive wheels. It is concluded not only that external conditions exert a strong influence on the general behavior of the motor plow, but also that the same differences in external conditions produce unlike effects in the operation of the different individual plows.

Threshing with electricity in Iowa, F. S. DEWEY (*Elect. World*, 64 (1914), No. 8, pp. 378, 379, figs. 2).—Results obtained on several threshing jobs with an electrical threshing outfit owned by a neighborhood association in Iowa are reported.

The electrical equipment consisted of a 30-horsepower, 220-volt, 60-cycle, single-phase motor, operating at 1,165 R. P. M., and provided with pulley sizes to obtain three different speeds according to the kind and condition of the grain threshed. The threshing machine cylinder measured 32 in. with a 54-in. separator.

On five tests with barley, 1,150, 1,800, 1,045, 1,375, and 1,045 bu. were threshed with 140, 278, 160, 170, and 160 kilowatt hours, respectively. In two tests with oats, 1,125 and 720 bu. were threshed with 73 and 67 kilowatt hours, respectively.

In threshing barley a cylinder speed of about 1,100 R. P. M. was found to be most satisfactory. An advantage of the electric motor is said to be that the constant speed obtainable does not carry the grain over into the straw pile. It is thought that with electrical energy at 5 cts. per kilowatt-hour the operating expense will be 25 per cent less than that of a steam engine.

Performance tests of sugarhouse heating and evaporating apparatus, E. W. KERR ET AL. (*Louisiana Stas. Bul.* 149 (1914), pp. 178, pl. 1, figs. 64).—This bulletin reports a partial repetition and a continuation of laboratory experiments reported in Bulletin 138 (E. S. R., 28, p. 893), and the results of performance tests made on a large number of full size sugarhouse apparatus in Louisiana and Porto Rico.

The results obtained in the laboratory as regards the effect of air in the heating steam, of hydrostatic head, and of the quality of the steam on the coefficient of heat transmission were practically the same as those found in the previous experiments. Other conditions being equal, the lower the temperature and density of the heating steam, the smaller was this coefficient. "Increasing the density of the boiling liquid causes a loss in heat transmission due to the decrease in temperature fall according to the equation $y=CD^{3.1}$, in which C =a constant and D =density in degrees Brix. The total loss due to the density of the boiling liquid seems to be in excess of that due to loss of temperature fall. . . . The vapors evolved from liquor of high density or from liquor under hydrostatic head are superheated. The entrainment was less in the double tube calandria than in the standard calandria. . . . Within reasonable limits the coefficient of heat transmission seems to be independent of the temperature fall . . . and of the temperature of juice feed. The coefficients . . . obtained in the small laboratory apparatus were much higher than are obtained in full size evaporators. . . . The great temperature fall required in the last body of a multiple evaporator is due to the combined influence of greater amounts of air, steam of lower density, liquid of higher density, also in many cases, more foul heating surfaces than in preceding bodies. The downtake or circulation tube increased heat transmission materially. Long tubes give better results as to heat transmission than short tubes, due to better circulation. The double tube and the baffle plate calandria gave greatly increased heat transmission as compared with the standard types tested, indicating that attention to steam distribution and the removal of incondensable gases is very important.

The object of the sugar factory experiments was to obtain data regarding the capacity and economy of evaporating and heating apparatus, including multiple effects, vacuum pans and heaters, and data regarding barometric jet

condensers, especially the effect of design and operation upon the amount of injection water required and the vacuum obtained.

In the evaporator tests there was much variation in the temperature fall, even in evaporators of the same type, and there was little regularity in the variation of the temperature fall in the different bodies. The results as regards the effect of density and head on temperature of boiling were somewhat irregular, and observations of head were possible only in a few cases although the temperature rise is in all cases attributed to head as well as to density.

A great variation in the coefficient of heat transmission in the different bodies was found although the coefficient was always less for the last than for the preceding bodies. The greatest variation in the relative coefficients for quadruples, that of the last body being 1, was with the standard type of evaporator, that in the first being 5.09, in the second 6.95, and in the third 6.03. The Sanborn type was next in the amount of variation and the least variation was found in the Kestner type. The highest actual coefficients were obtained from the Webre atmospheric double effect. The film evaporators gave coefficients considerably higher than did the submerged tube evaporators. The average actual coefficient for the horizontal evaporators was some 13 per cent greater than the average for the standard.

The initial juice temperature was found to affect more or less the evaporating capacity, and data are also given showing the so-called self-evaporation due to the juice entering the first body at a temperature higher than that of boiling.

The heating efficiency was found to vary from a minimum of 85.06 to a maximum of 98.33 per cent, the average being about 94 per cent for all the tests, including different types and different numbers of bodies. It was also found that a multiple evaporator with a small number of bodies has a smaller loss due to radiation in percentage of the total heat supplied than one with a larger number of bodies. The effect of high rates of evaporation in increasing heat efficiency are also brought out.

In tests of vacuum pans, the coefficient of heat transmission for the coil pans with straight strikes was found to vary from a minimum of 76.28 to a maximum of 174.8, with the heating surface in fairly good condition. It is pointed out that although there is no definite relation between the highest ratio of length to diameter of coil and the coefficient of heat transmission, the length of the coil had much to do with the variation of the coefficients. Varying kinds of product were found to affect more or less the coefficient.

The temperature rise was found to vary from a minimum of 11.9 to a maximum of 27.5 degrees, the average being 19.7 degrees. The minimum rise was obtained with a calandria pan and the maximum with a 10-ft. coil pan. The effect of purity upon the temperature rise is clearly shown. "The capacity of a pan decreases with the purity, not only because of the low coefficient of heat transmission, but because of the reduced temperature fall due to rise of the boiling point as well."

The average coefficient of heat transmission for the Express type of calandria pan was 40 per cent greater than that in the coil pans and the temperature rise of boiling due to hydrostatic head, density, etc., was less in the calandria pans.

As regards rate of vapor formation it is stated that "for all practical purposes it may be assumed that the rate of vapor formation is proportional to the rate of steam condensation . . . and the velocity of vapors in a coil pan may be assumed to be the same at all times during a strike." The heat efficiency in vacuum pans was found to vary from 90.9 to 96.95 per cent and the tests did not show any difference in economy for coil and calandria pans.

In tests of juice heaters the coefficient of heat transmission varied from a minimum of 70.9 to a maximum of 375.1, the average being 155.3. Most of the low coefficients are said to be due to foul heating surface, as is also the variation in heat transmission. The heat efficiency varied from 90.13 to 96.79 per cent, the average being 94.1. The juice heater tests also brought out the importance of keeping the heaters in good condition.

In tests of sugarhouse condensers, particularly to gain information regarding the relative merits of the counter current and parallel current types, it was found as regards temperature that there is little difference in the results when worked counter current or parallel current. Pressure observations indicated the desirability of liberal size and careful designing of trays, both as to the size and location, in order to secure steady action and the prevention of pockets. As regards quantity of injection water it was found that, other conditions being the same, the weight of cooling water required per pound of vapor is almost proportional to the difference between the temperature corresponding to the vacuum and the leg pipe temperature, this difference varying from a minimum of 6.8° to a maximum of 25.8°. As regards the amount of cooling water required, there was in general a considerable advantage for the counter current type of condenser over the parallel current type.

Ventilation of cattle barns, R. KNOCH (*Kühn Arch.*, 5 (1914), pp. 289-308).—The results of investigations on the ventilation of cattle barns led to the following conclusions:

A cow contributes only about 20,000 heat units daily to the warming of the stall. The minimum permissible temperature in a cow stall may be from 17 to 18° C. (62.6 to 64.40° F.), and at times as low as 15° (59° F.). A complete change of air in the cow stall should occur from two to three times a day, since an animal should have about 50 cubic meters of fresh air hourly and the carbon dioxid content should not exceed 2.4 per cent. When the air is changed from 1 to 1½ times daily the limiting temperature below which the animal heat is insufficient to maintain the desired stall temperature is approximately 0°. It is, therefore, necessary at lower temperatures that the ventilating apparatus be so regulated as to limit the air addition to below the desired amount. In such cases it is advisable to provide a simple, easily regulated heater to heat the air previous to its admission to the stalls.

On excessively hot days ventilation depending on ordinary air movement is insufficient and some type of ventilator is usually necessary. In cold seasons the expulsion of bad air by means of foot boards and the admission and distribution of fresh air under the roof is the safest method for uniform heat distribution.

Movable hog houses, J. M. EVVARD and J. B. DAVIDSON (*Iowa Sta. Bul.* 152 (1914), pp. 201-246, figs. 38).—It is the purpose of this bulletin to describe and illustrate movable hog houses which have undergone successful tests at the station.

The essentials of an ideal hog house are pointed out as warmth, dryness, abundance of light and direct sunlight, shade in summer, ventilation, sanitation, safety and comfort as regards doorways and floors, convenience, serviceability, sufficient size to shelter advantageously, durability, reasonably low first cost, minimum cost of maintenance, and pleasing appearance. The important considerations to be emphasized in selecting the location of the hog house are said to be economy in labor and time in management, drainage, sunny exposure, southern slope, protective windbreaks, nearness to pasture and summer shade, suitable elevation, prevention of odors reaching dwelling, and lessened risk from disease infection.

The advantages and disadvantages of the movable house as compared with the centralized are discussed. The movable types, of which photographs, specifications, working drawings, bills of material and labor, and estimates of cost are presented, are the Iowa gable roof house, the Ames combination roof house, the "A" house with doors hinged at the sides, the "A" house with doors hinged at the top, the tepee house, and the economy house.

In a series of experiments conducted with a house of each type the range of temperature was found to be greater within the new metal "A" houses than within the standard wooden house. The metal house was hotter in the middle of the day and colder at night than the wooden, and in no instance was the metal house the cooler at noon or warmer shortly after midnight.

It is concluded in general as regards all the types that the selection of the best possible hog house is largely a problem of correctly interpreting local conditions.

Silos in Oklahoma. C. I. BRAY and D. R. FORRESTER (*Oklahoma Sta. Bul. 101 (1914)*, pp. 83, figs. 87).—It is the purpose of this bulletin to describe the more common types of silos and to point out the essential features of a good silo and the most common defects of construction. The types of silos discussed range from the cheaper forms of homemade wooden or pit silos to the more expensive types, as concrete, tile, or metal silos.

It is stated that spoiling of silage in metal silos due to radiation of heat has not as a rule been found under Oklahoma conditions. Detailed instructions for the construction of the different types of silos described are given, with tables of quantities for different sizes of silos and bills of material.

RURAL ECONOMICS.

The training of rural leaders. K. L. BUTTERFIELD (*Survey, 33 (1914), No. 1, pp. 13, 14*).—The author believes that rural leadership is necessary to maintain a consistent philosophy of the rural problem, to vitalize rural movements, and to unite the people into effective organizations. The local leadership should be trained through service in its own rural community and professional leaders or organizers should be trained in special schools patterned after school training for social service in cities. The author believes that the rural district does not need so much men or women of great learning or research as a kindling of the imagination and an enlargement of the view of the local leader through occasional conferences at some institution, as an agricultural college.

The rural community and church federation. J. R. HARGREAVES (*Amer. Jour. Sociol., 20 (1914), No. 2, pp. 249-260*).—The author discusses the underlying reasons for the seemingly unnecessary number of small churches in rural communities, outlines a constitution for a federated church, and defines the attitude toward federation in several typical communities.

The land and the laborer. H. ARONSON (*London, 1914, pp. XIV+290*).—The author maintains as the reason for the decrease in the number of agricultural workers in Great Britain the breaking off of the personal relationship that previously existed between the lord of the manor and his laborers and tenants, the influx of people from the cities who take no part in agricultural production, the transfer of village and home industries to manufacturing centers, and the decline in the real wage of the agricultural worker. He believes that this low wage has led to physical inefficiency and advocates an increase so that the farm laborer can be properly fed, clothed, and sheltered. He also calls attention to the need of better housing conditions, but warns against so increasing the rents as to take up all the increase in wages. He believes that the cottage gardens are not sufficient in size and that the agricultural laborer should be

given an opportunity to acquire small allotments and gradually work up into an independent farmer. While he is acquiring the land there should be a co-operative organization to list the workers and the types of work that they are efficient in, so that all inquiries for laborers can be readily satisfied. He also advocates that the cooperative movement should be extended to securing credit for the small farm operator.

The land and the capital, G. FERNÁNDEZ DE LA ROSA (*Bol. Agr. Téc. y Econ.*, 6 (1914), Nos. 61, pp. 67-78; 62, pp. 139-149; 63, pp. 238-248; 64, pp. 333-342; 65, pp. 430-439; 66, pp. 513-523).—The author discusses the economics of production as it relates to agriculture, the influence of proximity to centers of population upon land value, and of local customs, fiscal regulations, and ownership upon agricultural production, the various forms of capital, the development of agricultural credit in Spain, and the reforms suggested for reorganization of the rural credit of that country.

Compensation to tenant farmers in England and Wales for improvements and for disturbance (*Internat. Inst. Agr. [Rome], Mo. Bul. Econ. and Soc. Intel.*, 5 (1914), No. 7, pp. 89-102).—This article discusses the common law position of the tenant farmer, the legislative changes in regard to his position and further alterations suggested, and concludes that the legislation giving the tenant the right of compensation for improvements and disturbance tends to lead to more fundamental changes in the relations existing between landlord and tenant, and may even lead to the adoption of a different system of tenure altogether.

Report of the departmental committee on agricultural credit in Ireland (*Dept. Agr. and Tech. Instr. Ireland, Rpt. Agr. Credit, 1914, pp. XVI+407, pls. 3*).—This report discusses the types and amount of credit furnished the farmers by various credit institutions and the cooperative credit movement in Ireland.

Among the findings of the committee were that the very large sums on deposit in postal savings banks in rural districts prove that there would be ample funds for small rural credit purposes if the confidence of depositors could be attracted, and that the history of the existing cooperative credit associations shows that there is need for state supervision to inspire this confidence. The tendency of a peasant proprietary to incur overindebtedness is deemed a real danger, from which the new tenant purchasers in Ireland should be safeguarded. A complete system of compulsory registration of title is an absolutely indispensable condition of every sound system of real credit. From the borrowing farmer's point of view the absence of an amortization scheme for repayment and the uncertainty as to when a mortgage may be called in are serious drawbacks to the present method of obtaining capital.

The committee believes that the attention of the new holders should be directed rather to making the most of their land by work than by pledging it for the purpose of borrowing. The establishment of a long-term-credit mortgage institution on *Landschaften* lines may eventually become a necessity in Ireland if it be not found possible to revise the land-loan schemes of the Board of Works with a view to their greater elasticity and their adaptation to the needs of small farmers. The development also of the agricultural loan schemes of the Department of Agriculture and of the Congested Districts Board, combined with the agency of credit societies for shorter term loans, should prove sufficient in most cases for the credit requirements of farmers not met by the joint stock banks. The full development of these sources of credit should be thoroughly tested before any experiment based on continental land-mortgage-credit organizations be attempted.

The German credit institution, 1900–1909, F. SCHULTE (*Veröffentl. Statist. Bodenkr. [Bavaria], No. 1 (1911), pp. V+43, pls. 6*).—This report gives with considerable detail the progress of agricultural credit in Germany and shows for 1900–1909, by statistical data, the form of the loans, the active and reserve capital, and the rate of interest for a large number of credit institutions.

Proceedings of the first annual conference of cooperative associations (N. Y. Dept. Agr. Bul. 63 (1914), pp. 2201–2328, pls. 2).—At this conference methods of purchasing farm supplies and the marketing of farm products were discussed, and brief reports submitted concerning the different types of cooperative organizations within the State.

Helps for organizing farmers' clubs and cooperative associations ([Washington, D. C., 1914], pp. 22).—Contained in this report are suggestions for organizing farmers' clubs and model constitutions and by-laws promulgated by the conference of business men in connection with the conferences on country life development at Louisville, Ky., April 9, 1914 (E. S. R., 30, p. 608).

Report of the California fruit growers exchange, 1913–14, G. H. POWELL (*Cal. Fruit Growers Ex. Circ. 3 (1914), pp. 11*).—This annual report sets forth what has been accomplished in the various departments of the exchanges and gives an insight into their methods and management.

Marketing farm products, W. W. HIGGINS (*Vt. Dept. Agr. Bul. 17 (1914), pp. 61, figs. 24*).—The author outlines briefly methods of marketing and distributing farm produce and gives a detailed description of packages and methods of preparing and grading fruit, vegetables, and other produce for market.

The agricultural outlook (U. S. Dept. Agr., Farmers' Bul. 629 (1914), pp. 35, figs. 5).—On October 1 the composite condition of all crops was 99.3 per cent of average conditions, indicating 6.4 per cent better yields than last year, when production was below the average.

On the basis of an inquiry made of the crop reporters N. C. Murray has determined the disposition of certain farm crops. The following table gives the principal results:

Quantity and percentage of total crops fed to specified farm animals.

Kind of animal.	Corn.		Oats.		Barley.		Hay.	
	Total crop.	Per capita quantity.	Total crop.	Per capita quantity.	Total crop.	Per capita quantity.	Total crop.	Per capita quantity.
	<i>Per cent.</i>	<i>Bushels.</i>	<i>Per cent.</i>	<i>Bushels.</i>	<i>Per cent.</i>	<i>Bushels.</i>	<i>Per cent.</i>	<i>Tons.</i>
Horses and mules.....	27.0	29.2	46.4	21.0	14.8	1.1	35.9	1.190
Milch cows.....	8.6	11.1	5.0	2.7	4.4	.4	23.2	.920
Other cattle.....	9.4	6.7	1.8	.5	1.1	.1	15.5	.340
Swine.....	26.8	11.2	1.8	.3	9.4	.3	.3	.004
Sheep.....	2.2	1.2	1.8	.4	.6	.....	5.1	.080

There is also included a report of the condition of the wheat crop of 1913–14, the cotton crop in the United States and British India, sugar beets and citrus fruit in the United States and in foreign countries, data as to the trend of farm prices, and a preliminary estimate of the crop production in Canada.

T. N. Carver has contributed an article on taking pains and points out that when one gets the habit of keeping accounts, of rotating and diversifying crops, of making the farm feed the family, and running cooperative enterprises, it is not half as much trouble as it was feared that it would be when first considered. He claims the real test of a farmer's quality is his ability to take pains in the things mentioned above.

Statistical tables are shown giving the estimated surplus of wheat and flour by States, the condition, production, forecast, and prices of specified crops by States on October 1, 1914, the average prices paid in the United States to producers for farm products in recent years, and the range of prices of agricultural produce at market centers.

Agricultural production in Belgium (*Min. Agr. et Trav. Pub. [Belgium], Off. Rural Raps. et Communs., No. 9 (1914), pp. 307*).—Contained in this report are statistical data showing for 1913 by provinces and minor subdivisions the area, average yield, production of the principal farm crops, and number of live stock, and by months for 1914 the number and price of meat animals at the principal markets.

Agricultural statistics of Belgium (*Ann. Statis. Belg., 44 (1913), pp. 251, 252, 346-375*).—Among the statistical data shown in this report are the number of cooperative societies, their membership, and amount of business transacted from 1895 to 1912, the agricultural population for 1846, 1880, and 1895, the area in specified crops for 1910, the number of farms by size for 1846, 1866, 1880, and 1895, the amount of commercial fertilizer used in 1909, the number of agricultural machines on farms in 1880 and 1895, and the number of live stock by ages for 1840, 1846, 1856, 1866, 1880, and 1895.

A collection of statistical and economic data relating to the agricultural industry in Russia and in foreign countries (*Rec. Données Statis. et Écon. Indus. Agr. Russie et Pays Étrangers, 7 (1914), pp. XIV+624*).—This annual report contains statistical data showing for 1912, with comparative data for earlier years and by minor geographic divisions, the total production, area, and average yield of the principal farm crops, number of distilleries, breweries, and sugar and tobacco factories, and quantity of materials used and produced, for 1911 the number of live stock, and for 1912 the trade in agricultural products, the wages of farm laborers, and information regarding agricultural credit.

A B C of Queensland statistics, 1914, compiled by T. WEEDON (*Brisbane: Govt., 1914, pp. 41*).—Among the statistical data shown in this annual statement are the area cultivated and in the principal crops, the production, the crown lands alienated, leased, or in other form of alienation, the number of live stock, and the quantity of agricultural products manufactured in Queensland. In many instances comparative data are shown for other States.

AGRICULTURAL EDUCATION.

[Report on agricultural education work in California, 1914] (*California Sta. Rpt. 1914, pp. 11-24, 52-59, 76-83, figs. 6*).—This report contains accounts of the internal and external instruction of the department of agriculture of the University of California by the director; of the work of the University Farm School at Davis, by H. E. Van Norman; of the division of agricultural education, by W. G. Hummel; and of the agricultural extension work, by W. T. Clarke.

[Home economics work at the University of Illinois] (*Ill. Agr., 18 (1914), No. 7, pp. 399-430, 432, 434, 436, figs. 9*).—A number of papers by different authors are included. As a whole the material presented gives an idea of the extent and character of the students' work in this subject.

Massachusetts independent vocational schools in operation May 1, 1914 (*Bul. Bd. Ed. Mass., No. 5 (1914), pp. 63*).—This bulletin includes a statistical summary arranged according to types of schools, laws under which the schools are operated, and a descriptive catalogue of all state-aided vocational schools in Massachusetts, including, among others, 4 agricultural schools, 8 agricultural departments in high schools, and 25 home-making schools.

Social surveys of rural school districts, C. J. GALPIN and G. W. DAVIES (*Wisconsin Sta. Circ. 51 (1914), pp. 15, figs. 3*).—This circular explains what a social survey is, how it aids the teacher, and how it is made, and gives some results of school district surveys and a suggestive outline for a district survey.

Practical training in negro rural schools, J. DAVIS (*Hampton Bul., 9 (1913), No. 6, pp. 15, figs. 20*).—To give an idea of the definite improvement brought about by supervision and industrial training in negro rural schools in Southern States, largely through the aid of the Jeanes Fund, the author gives a summary of the work in Virginia in 1912-13. One of the most promising developments of this work has been the cooperation of the supervising industrial teacher with the farm demonstration agent in girls' gardening and canning club work during the summer months.

[**Home and school gardening**] (*Ann. Rpt. Home and School Gard. Com., Twentieth Cent. Club Detroit, 10 (1913), pp. 28, figs. 12*).—A brief review of the committee and its work from its establishment in April, 1903, to the present time is given. On July 1, 1913, instruction in the practical school gardens in Detroit passed under the control of and was furnished by the board of education, although the maintenance of the gardens still remains a part of the obligations of the organizations which brought them into existence.

[**Agricultural education in Canada**] (*Agr. Gaz. Canada, 1 (1914), No. 4, pp. 235-332, figs. 10*).—A report is given of the Conference of Agricultural Instruction held in Ottawa March 24 and 25, 1914, consisting of the representatives of the Dominion and provincial departments of agriculture and education and of the agricultural and veterinary colleges in Canada. The salient features of the demonstration work carried on under the agricultural instruction act and the agricultural instruction in the schools and agricultural colleges and schools in the various provinces are briefly reported on.

The number also contains a description of the buildings and equipment and information concerning courses of instruction of the Saskatchewan College of Agriculture, and the recommendations of commissions appointed in 1912 to investigate agricultural and industrial education in Saskatchewan and British Columbia, respectively.

Scheme of agricultural education (*Preston, England: Lancashire Ed. Com., 1914, pp. 85, pls. 11*).—An outline is given of the scheme of agricultural education to be carried out in 1914-15 in Lancaster County at the County Council Farm, the dairy, poultry, and horticultural schools at Hutton, near Preston, the County Council Agricultural School, at Harris Institute, Preston, and in various parts of the county.

A residential course for the training of farm lads, G. H. GARRAD (*Jour. Bd. Agr. [London], 21 (1914), No. 4, pp. 292-300*).—This is a description of a month's course begun in the latter part of December, 1913, at Toys Hill, Kent County, England, for the purpose of interesting farm laborers and small farmers in their work and instructing them in manual labor.

Only 20 applicants between 16 and 20 years of age who were actually at work on farms in the county were admitted. They were divided into three classes for practical work, but all classes were combined for lectures, so that fairly close individual attention was possible for all students. The course of instruction included farm carpentry, forge and rough veterinary work, hedge laying, draining, thatching, pruning and growing fruit trees, the measurement of land and stacks, wood cutting, sharpening tools, construction and setting of farm implements, killing, plucking, and trussing chickens, calf rearing, kitchen gardening, and lectures on how plants feed and grow. The amount of time devoted to each subject depended very largely on the weather, which permitted

of 38 hours of lecture work and 98½ hours of practical work. On three afternoons excursions were made to neighboring farms. A garden being the only land attached to the house in which the school was held, much of the practical work had to be done on neighboring farms.

History of Grignon, L. BRETIGNIERE and L. RISCH (*Histoire de Grignon. Chateauroux, 1910, pp. 244+LXXV, pls. 5, figs. 29*).—The history of Grignon from its origin in 1827 to 1909, an account of its organization, equipment, and instruction in 1909, and occupations of former students are given. Admission examinations, the faculty, and description of subjects are appended.

Memorial of the foundation of the Forestry Education Institute, Maria-brunn, 1813, and the Imperial Royal Agricultural High School of Vienna, 1872 (*Zur Gedenkfeier der Gründung der Forst-Lehranstalt, Mariabrunn, 1813, und der K. K. Hochschule für Bodenkultur in Wien, 1872. Vienna, 1912-13, pp. VI+316, pl. 1, figs. 34*).—This memorial contains a detailed account of the development of high school (collegiate) forestry instruction in Austria by von A. Cieslar; agricultural instruction from 1872-3 to 1911-12, by A. Ritter v. Liebenberg de Zsittin; agricultural engineering instruction at the agricultural high school from 1883-1912, by A. Friedrich; and of the various faculties, special lecturers, institutes and associations, history and attendance of the agricultural high school from 1872-1912, organization of faculty in 1912-13, and an outline of the course of study.

Agricultural instruction [in Bohemia] (*Ber. Deut. Sekt. Landesk. Rates Königr. Böhmen, 21 (1912), pp. 23-70*).—Detailed reports are given of the work of the itinerant agricultural instructors, together with statistical data on itinerant instruction, and notes on agricultural schools in Bohemia.

Some considerations of the proposals for effecting uniformity in methods of instruction in elementary agricultural schools, M. PROCHASKA (*Land. u. Forstw. Unterrichts Ztg., 28 (1914), No. 1, pp. 47-55*).—In this discussion the author frequently refers to the opinions of F. Jachimowicz, previously noted (*E. S. R., 30, p. 195*). He thinks, however, that while the 3-semester winter schools recommended by the latter may seem desirable the 2-semester winter school with a farm and obligatory summer course and with a more uniform direction is the next goal to be aimed at.

Elementary exercises in agriculture, S. H. DADISMAN (*New York, 1914, pp. VII+106, figs. 54*).—Simple laboratory experiments to be conducted by the pupils in the study of soils, plants, weeds, horticulture, domestic animals, insects, bacteria, birds, etc., as well as methods of conducting excursions, study, and discussion, are outlined.

Laboratory exercises in the elements of agriculture, E. E. LACKEY (*Wayne, Nebr., 1914, pp. 86*).—Outlines are given for 38 exercises in the study of plants, soils, insects, dairying, and feeding materials, together with a list of the necessary apparatus.

[Agriculture in the Missouri high school] (*Rpt. Pub. Schools Missouri, 64 (1913), pp. 165-188*).—This article presents a syllabus of a course in agriculture, lists of required equipment in the laboratory and library, and suggestions to teachers on the use of demonstration plats and notebooks, community surveys, etc., to bring about some uniformity in equipment and instruction in the high schools receiving state aid for agricultural instruction. A list of library books on agriculture is added.

MISCELLANEOUS.

Annual Report of California Station, 1914 (*California Sta. Rpt. 1914, pp. 215, pl. 1, figs. 38*).—This contains the organization list, reports of the director,

heads of divisions, and others. The text of the Smith-Lever Act is appended. The experimental work reported is, for the most part, abstracted elsewhere in this issue.

Biennial Report of Connecticut Storrs Station, 1912-13 (*Connecticut Storrs Sta. Rpt. 1912-13*, pp. X+416, pls. 4, figs. 100).—This contains the organization list, a financial statement for the fiscal years ended June 30, 1912, and June 30, 1913, a report of the director, and reprints of Bulletins 70-79, previously noted.

Twenty-sixth Annual Report of Massachusetts Station, 1913 (*Massachusetts Sta. Rpt. 1913*, pts. 1-2, pp. X+59a+201, pls. 2, fig. 1).—This contains the organization list, reports of the director and heads of departments, a financial statement for the fiscal year ended June 30, 1913, and reprints of Bulletins 148-155, previously noted. The report of the director includes fertilizer tests with asparagus, rhubarb, blackberries, raspberries, alfalfa, apples, and corn. The report of the entomologist is abstracted on page 245 of this issue.

Twenty-sixth Annual Report of Texas Station, 1913 (*Texas Sta. Rpt. 1913*, pp. 85).—This contains the organization list, a financial statement for the federal funds for the fiscal year ended June 30, 1913, and for various state funds for the fiscal year ended August 31, 1913, a report of the director on the work of the station and the various substations, and the text of the various federal and state laws relating to the station. The experimental data recorded are, for the most part, abstracted elsewhere in this issue.

A handbook for farmers and dairymen, F. W. WOLL ET AL. (*New York and London, 1914*, 6. ed., rev., pp. XVI+490, figs. 10).—A sixth edition of this work (E. S. R., 11, p. 883). It is stated that a number of new subjects have been added and tables and articles brought up to date.

NOTES.

American Farm Management Association.—The fifth annual meeting of this association was held in Washington, D. C., November 9 and 10, 1914, with an unusually large attendance and marked interest.

The address of the president, D. H. Otis, dealt with *The Farm Manager Well Trained*. Professor Otis claimed that farm management consists in coordinating all the forces connected with agriculture to the farmer's financial gain. Courses in farm management should be practical, based on the accounts of individual farmers, and should develop executive and business ability. He favored requiring active farm experience of all farm management students, and claimed that it is better to have students work on good farms at a low wage than on poor farms at a better wage. The system of accredited farms which has been developed in Wisconsin was explained.

Reports were received from the standing committees on teaching and investigation. The former committee presented through K. C. Livermore, chairman, detailed outlines of the courses in farm management in several agricultural colleges. It was found that of 40 colleges reporting, 38 offered farm management as a separate study in 1913-14, an average of four hours' credit being allowed exclusive of advanced and seminar courses. Suggestions for the arrangement of elementary courses and replies to various questions submitted were also included. Some differences of opinion were found as to the proportion of time which should be allotted to farm management, the requirement of this subject of all agricultural students, and prerequisites for admission to this course, including farm experience. The consensus of opinion was unfavorable to the operation of separate farm management farms to demonstrate business methods. The cooperation of institutions in the exchange of illustrative material was advocated.

The committee on investigation, J. A. Foord, chairman, recommended the utilization of a central agency such as the Office of Farm Management of this Department to serve as a clearing house for the exchange of projects. The appointment of a special committee on standardization of terms used in farm management was also suggested.

F. A. Pearson discussed the *Fundamental Principles in Keeping Farm Accounts*. He claimed that farmers should be organized to keep accounts and stated that in Illinois associations had been formed for this purpose, in several instances the work of the local cow testing associations being used as a medium. D. H. Otis outlined a form of accounting wherein by the mechanical arrangement of the book used a farmer can carry on his accounts with as little posting as possible.

O. R. Johnson considered the use of the farm diary in farm management investigations, and stated that because of the large amount of labor required to keep farm records, efforts should be made to simplify the usual method as much as possible. A method that he has devised requires the proprietor to make all reports for the day on a single sheet, a chore statement at the end of the month, and a feeding statement when changes in feeding or in the number of live stock took place. These records are transmitted to the central

office at the college, where they are transferred to the ledger and a complete statement for the year obtained and returned to the farmer.

Farm organization investigations and their relation to the farm survey were taken up by C. L. Goodrich. He enumerated as essential to success in farming the general organization of the farm, the selection of suitable features in the way of live stock and crops, and the making of the management of man, horse power, labor, and capital more effective. Survey work is intended to study organization and practices, and to learn which are successful and unsuccessful and the reason why. The area selected should be typical as to soil and farm practices, and at least 100 farms should be studied for a series of years.

J. H. Arnold discussed *Some Principles of Farm Organization*, taking as the basis of his paper the crew efficiency. He stated that farm practices are usually a result of the experience in that section, and before any of these should be changed there should be a thorough study of the community. The area devoted to a particular crop is limited by that operation which determines the minimum acreage that can be cared for during a certain period of the season.

A. D. McNair called attention to the fact that the area cultivated varies with the amount of work, size of animals, labor, supplies, etc. He considered that the farmers know practically how much a certain crew can cultivate in their region, and it is chiefly in connection with new crops that they need assistance. He also pointed out that if one part of the farm operation is varied that it may have marked influence upon all the other farm operations and upon the economic movement on the crops in that locality.

Under the title of *Efficiency Factors and Caution in Their Use*, G. F. Warren enumerated as the principal factors in efficiency the size of the business, diversity of crops, crop yields, and production per acre. Unless the farm is efficient in all of these factors the chances are that the farm income will not be as high as possible, but the size of business is probably the most important.

K. C. Livermore discussed the *Method and Application of Farm Efficiency Analysis*. He stated that the analysis should vary with the purpose for which it was being used, and that by picking out the successful farmer and selecting the factor that made that farmer efficient, a standard would be obtained that would give a better judgment as to what successful farming should be than to take the average for the community. To suggest improvements in the management of a farm requires a knowledge of the local conditions, the system of farm management in the community, the farmer's temperament, and the ability of his family to aid him in his farm work.

W. A. Etherton discussed the relation of the income of farms to the investment in buildings. He maintained that the value of buildings varied with the farm capital, with the income, and with the size of the farm, and that there seemed to be more or less correlation in this relationship.

Plans for farm management demonstration were outlined by L. H. Goddard. Caution was deemed essential in beginning such work and radical changes should be postponed until the confidence of the community is gained. He pointed out that in most localities, demonstration work is still in a pioneer stage and emphasized the constant need of tact on the part of demonstrators.

M. C. Burritt described the system of farm surveys being made in New York as a basis for the offering of suggestions. He too pointed out the need of conservatism in giving advice, especially to the individual. G. P. Scoville outlined the practical workings of the New York system in greater detail, including the correspondence methods in use, and H. W. Hawthorn discussed some experiences along this line in Ohio. The application of farm management surveys in Massachusetts was discussed by H. J. Baker, who narrated some

practical results there. C. B. Smith concluded the program with a summary of What This Meeting Teaches in Farm Management Extension.

Officers were elected as follows: President, A. Boss, of Minnesota; vice president, J. A. Foord, of Massachusetts; and secretary-treasurer, G. A. Billings, of Washington, D. C. The 1915 meeting will probably be held at Berkeley, California, August 9 and 10, a number of joint sessions with other organizations meeting at that time being contemplated.

Association of Official Agricultural Chemists.—The thirty-first annual convention was held November 16 to 18, 1914, at Washington, D. C., with the largest registration in the history of the association.

The address of the president, E. F. Ladd, dealt with the increased demands placed on the agricultural chemists by the enactment of the inspection laws of recent years, and emphasized the need for calling into the service other specialists, such as physiologists. The work of the association was also discussed, and the necessity of devising a means of publishing the proceedings and methods of the association was dwelt upon, as well as the desirability of a journal of agricultural chemistry. Dr. H. W. Wiley also addressed the association on some problems raised by the war.

C. L. Alsberg, secretary of the association, presented a digest of what had been done in the way of gaining information relative to methods and costs for publishing the proceedings of the association, and of a journal of agricultural chemistry. C. H. Jones, on behalf of the executive committee, recommended (1) that the proceedings be published in the form of a quarterly; (2) that a one-half day session be given to section meetings to be arranged by the executive committee; and (3) that the matter of the revision of the constitution and by-laws relating to annual dues be left until the 1915 meeting. This report was adopted by the association.

The association admitted municipal chemists to associate membership. Resolutions were adopted in memory of the late Professor Francis H. Storer, of the Bussey Institution of Harvard University. The committee on food standards, on the motion of its chairman, W. Frear, was discharged.

A. J. Patten, referee on phosphoric acid, reviewed the work of the past two years. The opinion was expressed that the variations for total phosphoric acid reported by cooperating analysts were probably due to iron, and possibly manganese, being carried down with the yellow precipitate. The determination of total phosphoric acid was studied in this year's cooperative work by the official gravimetric, the optional volumetric, and the von Lorenz (E. S. R., 13, p. 14) methods; and the available phosphoric acid by the molybdate, optional volumetric, von Lorenz, and iron citrate (E. S. R., 29, p. 410) methods. Four slags and a synthetic solution corresponding as nearly as possible to a citric acid solution of an average basic slag were used, and the results obtained were very satisfactory, especially with the iron citrate and von Lorenz methods. Further work is to be done on the methods for basic slag, with special attention to standardizing the alkali solution used in the volumetric method.

The associate referee on phosphoric acid, L. S. Walker, presented results of studies on neutral ammonium citrate solution with the titration (E. S. R., 29, p. 718) and litmus methods. The work for the coming year is to ascertain whether neutral ammonium citrate, sodium citrate, or citric acid solution should be employed as a solvent in the determination of reverted phosphoric acid in fertilizers. Suggestions were made by P. Rudnick as to obtaining a substitute for neutral ammonium citrate, and in this connection a paper on ammonium tricitrate, by R. A. Hall, was presented (see p. 205).

R. N. Brackett, referee, and H. D. Haskins, associate referee, for the determination of nitrogen, reported on work which had for its chief object the

ascertaining of whether the establishment of certain standards of nitrogen activity for raw materials and mixed fertilizers furnishing organic nitrogen is warranted. The materials studied were tartar pomace, dried blood, nitrogenous manures containing about 6, 8, and 9 per cent of nitrogen, beet-root manure, and a mixture consisting of beet-root manure and nitrogenous manure 3:1.

The previous experiences that both the Jones and Street methods are satisfactory for differentiating between good and poor organic nitrogenous material were confirmed by this year's work, with one exception. The Jones method gave results more in accordance with pot tests than the Street method and is somewhat shorter, but the work showed that in the hands of inexperienced persons more uniform figures are obtained by the Street method. Both methods are to be further studied with the view of increasing the accuracy of the water-insoluble nitrogen determination, and in the case of the Jones method to overcome the difficulties experienced by most analysts in the distillation with alkaline permanganate.

Collaborative results with the Kjeldahl-Gunning-Arnold method in its present state on the whole were very satisfactory. When copper sulphate was used in lieu of oxid of mercury the time of digestion was somewhat prolonged, and the method, although adopted as official, is to be further studied. Nitrogen determinations by the Gunning copper method and the Kjeldahl-Gunning-Arnold method were made by A. J. Patten on a large variety of animal and vegetable materials. The results reported by the cooperating analysts with the zinc-ferrous sulphate-soda method for nitrates indicated that more work is necessary before it can be recommended for adoption as official.

The associate referee on the availability of potash, E. E. Vanatta, gave a report of progress on a series of pot culture experiments in conjunction with the department of soils of the Missouri Station, for the purpose of studying the effect of different soil treatments on the availability of potash in ground feldspathic rock. The availability was measured by plant (corn) growth supplemented by chemical determinations.

Work on the determination of potash, reported by T. D. Jarrell, associate referee, included cooperative tests on (1) the use of denatured alcohol for washing potassium platinic chlorid; (2) the necessity for the use of hydrochloric acid in the water extract; and (3) the perchlorate method. The samples tested were commercial muriate of potash, kainit, and a mixture of kainit and acid phosphate. The results obtained collaboratively with the perchlorate method showed quite a variation, and with mixed fertilizers it consumes too much time, but it was concluded that in the hands of analysts familiar with its limitations, and with some modifications, especially with regard to the method of washing the potassium perchlorate, it might give reasonably uniform and dependable results. Ethyl alcohol denatured with methyl alcohol, or with benzin and methyl alcohol, can apparently be safely used as a wash for potassium platinic chlorid, but pyridin can not be used as a denaturant.

In the collaborative work comparing the official method with modifications in which the addition of hydrochloric acid was omitted, certain differences were noted, but all results were well within the limits of experimental error. The association next year is to study why hydrochloric acid is added to the potash extract, the perchlorate method with regard to washing the perchlorate precipitate, and the use of denatured alcohol.

J. W. Ames, referee on soils, in discussing means for estimating organic carbon in soils containing carbonates pointed out that the official method for carbon dioxide in soils was indefinite. He reported a study of methods for determining inorganic carbonic acid and organic carbon in soils, and some data obtained with other methods. A further test of methods for the determination

of soil carbonates is to be made, comparing (1) the Marr method (E. S. R., 22, p. 511) with methods which involve the use of dilute hydrochloric acid and constant aspiration of air with and without heating, and (2) the wet combustion method with a mixture of chromic and sulphuric acids for estimating organic carbon with the combustion of the soil in the furnace, as well as of the Hutchinson and MacLennan method for determining the lime requirements of the soil. The official method for carbon dioxid is to be eliminated.

C. B. Lipman, referee on nitrogenous constituents of soils, expressed the opinion that the association has been giving considerable time to the study of methods for soil chemical work which are already well established, while the study of some of the methods now in use which need much improvement has been neglected. The methods for nitrites and nitrates and for ammonia, as adopted for water in 1913, were accepted as official methods for the determination of these constituents in aqueous soil extracts.

W. H. McIntire gave a brief account of a new method for determining the lime requirement of soil. In the method 10 gm. of soil is sifted through a 100-mesh sieve and heated with 100 cc. of a specially prepared calcium carbonate solution to a paste, the paste transferred by means of carbon dioxid-free distilled water to a flask and shaken with 5 cc. of 85 per cent phosphoric acid solution in a special device, and the liberated residual carbon dioxid collected in a 4 per cent sodium hydroxid solution contained in a Camp absorption tower. The amount of calcium carbonate in the carbonate solution is determined by backing off the excess of dissolved gas and decomposing the precipitated carbonate by the above procedure. The difference between the added and the residual calcium carbonate in the soil is then determined, a correction being made for the carbon dioxid in the air of the apparatus and the carbonate in the sodium hydroxid solution.

G. S. Fraps gave a paper on the interpretation of soil analyses which included a discussion of the various methods of analysis and the benefits to be derived therefrom. Experience has shown that pot experiments do not always confirm the chemical analysis, and the pot experiments are themselves open to irregularities. Standards of interpretation on the basis of the corn plant, however, will show the relative deficiencies of the soil in plant food.

The associate referee's report on alkali soil, given by R. F. Hare, consisted of a comparison of methods now in common use for the analysis of alkali soils. A number of analyses of New Mexico soils taken from a region in which black alkali is the dominant type were presented, followed by a review of some of the methods for the determination of alkali in soils. The association's method for alkali waters was provisionally adopted for alkali soils.

A cooperative study was reported by R. C. Roark on the determination of moisture, carbon dioxid, copper, arsenic, and lead oxid in Bordeaux mixture, Bordeaux-lead arsenate, and Bordeaux-Paris green, and comparing new methods for nicotin, and of arsenious oxid in Paris green with the official method. The official, C. M. Smith, and C. C. Hedges methods for total arsenious oxid in Paris green did not agree as closely as might be expected, and even the official method varied nearly 2 per cent. With a modification described both the Smith and Hedges methods gave better results. Methods for total arsenic present as As_2O_3 and As_2O_5 , and as As_2O_3 only, are proposed to displace those for total arsenic and water-soluble arsenious oxid.

The results with Bordeaux mixture (dry and paste) included those for copper (electrolytic and thiosulphate methods) and moisture. Good results were obtained in general by the analysts, but little work was done by the electrolytic method. With Bordeaux-Paris green the results for copper by the thiosulphate method, carbon dioxid, and moisture agreed very well, but total arsenic varied

more than it should. The methods given for Bordeaux-lead arsenate for the electrolytic determination of copper worked very well when applied to Bordeaux-Paris green. It was also found that the arsenious oxid could be easily determined by either the C. C. Hedges or C. M. Smith method. Water-soluble arsenic varied from 3.92 to 4.92 per cent. The results for Bordeaux with lead arsenate, moisture, carbon dioxide, lead, total arsenic, copper, and water-soluble arsenic agreed fairly well, considering the difficulties of analyzing a sample of this kind.

The results for nicotin by the Chapin silicotungstic acid method (E. S. R., 25, p. 16) agreed closely, and its adoption as an official method was urged. Some of the methods are to be further studied, but work on the Lloyd method for nicotin determination is to be discontinued.

W. W. Skinner, referee on water, gave an account of the work on the determination of strontium, with special reference to why low results were obtained in last year's work. The methods for strontium are to be studied further.

C. B. Williams, chairman of the committee on the availability of phosphoric acid in basic slag, presented a report of progress. C. L. Alsberg, of the special committee on the study of the vegetable proteins, reported that this committee was of the opinion that work in this difficult field of research should not be begun until some means could be found whereby it could be conducted under conditions that would assure its continuation for a sufficient length of time to enable those engaged in the work to acquire skill and experience in the methods of isolating and separating the proteins from one another and in the methods used for studying their properties.

J. Hortvet, referee on food adulteration, stated that several lines of investigations which were under way during the past two years have been either completed or the work has been so satisfactory that definite recommendations can be made for the final adoption of methods or for further study along well-defined lines. The work of the various associate referees was then reviewed.

W. E. Mathewson, associate referee on colors, reported on the coloring matters of a number of fruits, and gave a brief review of the literature pertaining thereto and upon coal tar dye mixtures.

The associate referee on fruits and fruit products, H. C. Gore, gave an account of collaborative work on the estimation of malic and citric acids in fruit juices, and stated that a new basis for a method for estimating citric acid has been found, in which the polariscope is used and sodium molybdate is the reagent. Methods for citric and malic acids are to be studied further.

B. G. Hartmann, associate referee on wine, gave the results of studying methods for determining tartaric acid in wine and grape juice. The figures submitted by the various collaborators showed that the method described in Bulletin 107, revised, p. 86, is unreliable when phosphoric acid is present. The association voted to study further the proposed method with regard to its use for red wines, and also to study the effect of adding Rochelle salts instead of tartaric acid as provided in the Hartmann and Eoff method.

The method for determining phosphoric acid in beer by the addition of calcium acetate and subsequent ashing was adopted as a provisional method instead of the direct volumetric determination with uranium acetate. A paper on Maraschino cordials was presented by J. G. Riley and A. L. Sullivan.

The associate referee on vinegar, E. H. Goodnow, reported on work done with cider vinegar and with methods 6, 11, 15, and 17, as given in the 1911 proceedings of the association, and these methods were adopted provisionally. Methods 10 and 20 are to be given further study.

A report on flavoring extracts was given by the associate referee, A. E. Paul, and a paper on the relationship between the alcohol-soluble solids and ether-soluble solids in standard ginger extracts by C. W. Harrison and A. L. Sullivan.

The associate referee on spices, R. W. Hilts, after reviewing the status of methods for catsup examination recommended that final action regarding the lactic acid and citric acid methods be withheld pending further study and the collection of data, and that methods for determining insoluble solids and sand as applied to tomato catsup (U. S. Dept. Agr., Bur. Chem. Bul. 162, pp. 128, 129) be adopted as provisional. These recommendations were adopted.

R. E. Remington, associate referee, reported on cooperative work in the determination of lead in baking powders, particularly the alum phosphate type, and dwelt principally on the simplification and improvement of existing methods. E. L. P. Trenthardt, associate referee on heavy metals in foods, reported on determining arsenic and tin.

The cooperative work on fats and oils, presented by the associate referee, R. H. Kerr, consisted of a comparison of his own method (E. S. R., 29, p. 204) for the detection of phytosterol in mixtures of animal and vegetable fats, with the digitonin method of Marcusson and Schilling. Each method led to uniformly correct conclusions, and both were adopted as provisional methods.

J. Hortvet, associate referee on dairy products, reported a further study of the modifications of the continuous extraction method for determining fat in evaporated milk, sweetened condensed milk, and cream, and comparative fat determinations by the Röse-Gottlieb method. In the main the results obtained by the continuous extraction method, both with sweetened condensed and unsweetened evaporated milk, were lower than by the Röse-Gottlieb method, but a special investigation of the details of the various methods for determining fat percentages in condensed and evaporated milk was deemed imperative. G. E. Patrick, in discussing the Röse-Gottlieb method, stated that when it is modified and acid treatment after the usual extraction process is resorted to higher results are obtainable. This was concurred in by F. F. Fitzgerald and W. D. Bigelow. The method proposed in 1911 as applied to milk, evaporated milk, sweetened condensed milk, thin cream, and ice cream, is to be further studied, and special attention is to be given to the Röse-Gottlieb method along the lines suggested. C. M. Bradbury read a paper on the alkali method for the determination of fat in ice cream and condensed milk.

F. L. Shannon, associate referee on saccharine products, gave a report of a study of the Fiehe method and its modifications for the detection of added invert sugar in honey. The only advantage apparently gained by any of the modifications of Fiehe's test seems to be in the keeping quality of the reagent.

E. W. Magruder, associate referee on vegetables and canned goods, and J. B. Robb reported on a detailed study of the separable fluid of canned goods (tomatoes, green peas, and Lima beans). The studies are to be continued on the same lines as recommended by the referee in 1913. A. Viehoever gave an account of the characteristics of common and Lima beans.

Analyses of some commercial cocoas were reported by H. C. Lythgoe, associate referee. The Ulrich method for cocoa shells (E. S. R., 30, p. 413) has apparently no advantages over the fiber and pentose determination methods. The Baier-Neumann method for determining casein in milk chocolate should be further studied since objections have been raised against it on the grounds that it will not detect the casein rendered insoluble in chocolates by different methods of manufacture. The association voted to study the effects of high temperature used in the process of manufacture on the casein determination, and also to study the methods for crude starch in cocoa.

The associate referee on tea and coffee, J. M. Bartlett, gave a report on methods for determining caffeine.

A. F. Seeker, associate referee on preservatives, gave the results of a further study of the Fincke method (E. S. R., 26, p. 312) for the determination of

formic acid, as well as of a trial of the Fenton and Sisson reduction of formic acid to formaldehyde as a qualitative means for the detection of this preservative in foods. The endeavor was also made to note the effect of various interfering substances and caramel, and to determine how much formic acid is present in various materials and prepared food products when examined by the prescribed method. The Fincke method was adopted provisionally by the association. The natural occurrence of formic acid in food products is to be further investigated, and the Wegner method is to be given a trial as a confirmatory test. Steps are also to be taken to find a quantitative method for the determination of saccharin in foods.

E. B. Forbes, referee on organic and inorganic phosphorus, reported on inorganic phosphorus in vegetable and animal substances. The magnesia mixture method gave satisfactory results on blood, brain, liver, and flesh, and showed a recovery of 96 to 100 per cent of added phosphates. The work with vegetable materials was done on alfalfa hay, blue grass, rice polish, rice polish and phosphate, and middlings, soy beans, and oat straw with and without phosphate. It was found that the use of the centrifuge greatly facilitated the separation of dilute aqueous acid extracts of vegetable substances, and when filter pulp is introduced into the extraction process it materially assists in the maintenance of an easily penetrable condition of the magnesia mixture precipitate. The modification of the acid alcohol method of Forbes and associates by the introduction of filter paper pulp into the extraction, the use of excessive amounts of magnesia mixture in the first precipitation, and allowing an unusual length of time for precipitation gave apparently perfect results as judged from the recovery of added phosphates, but unsatisfactory results in other cases. No method was recommended for determining inorganic phosphates in vegetable substances generally. A number of recommendations, which included a description of methods for the examination of animal tissues, were made. The magnesia mixture method of Forbes and associates for the determination of water-soluble inorganic phosphates was adopted as official. Further efforts are to be made to obtain methods of separation of organic and inorganic phosphorus in vegetable foods.

L. S. Palmer, associate referee on the separation of nitrogenous substances in milk and cheese, pointed out the need of changing the term "albumin of milk" to "heat coagulable proteins." Studies on a method for heat coagulable proteins are also necessary, and methods ought to be devised for nitrogenous substances other than casein, albumin, and globulin. The so-called neutralization precipitate obtained from the filtrate of the acetic acid coagulation of cow's milk appears to be largely a mixture of di- and tri-calcium phosphates. The association is to make studies of methods for the determination of the noncasein proteins of milk and the products of protein decomposition in milk.

The associate referee on the separation of nitrogenous bodies in meats, A. D. Emmett, submitted a brief report on creatin and creatinin in meat extracts and meats by the Folin method and amino nitrogen in meat extracts and meats by the Van Slyke and Kober methods, and ammonia nitrogen in the same substances by the Folin (K_2CO_3), the Steel-Gies ($NaOH$), and the magnesium oxid methods. The work is to be continued.

L. I. Nürenberg, referee on dairy products, made a study of the refractive indexes of the copper, acetic acid, and soured milk sera and soured serum ash figures of milk, which are all used in the detection of added water. The optional and provisional methods for preparing copper and soured serum and for ash determinations in soured and acetic acid sera were adopted as optional-provisional. The Harding-Parkin method (E. S. R., 29, p. 507) for fat determination is to be given further study, likewise the enzym reactions of milk.

A. Viehoveer and C. O. Johns gave a paper on the determination of small quantities of hydrocyanic acid. The referee on feeding stuffs, G. L. Bidwell, made a plea for the retention of 6.25 as the nitrogen factor for general feeding stuff analyses. The association voted to retain this factor, and to make a further study of crude fiber methods.

C. K. Francis, associate referee on crude fiber methods, presented results of cooperative work on a sample of cotton-seed meal which suggested the need for further study of the official method. The chief trouble seemed to be with the filtering materials (linen, asbestos, or glass wool). A paper by G. L. Bidwell and G. P. Walton on the determination of crude fiber was presented, in which the effect of various factors which influence the results obtained were discussed.

C. Cutler, associate referee, gave an account of simple methods, macroscopical, microscopical, and otherwise, whereby adulteration in feeds may be detected. The incoming referee is to study samples containing unknown adulterants, quantitative methods for the detection of peat dried at high temperatures, and the maximum percentage of foreign material permissible in mill by-products.

W. A. Withers and F. E. Carruth presented a paper on gossypol, a toxic substance in the cotton seed (E. S. R., 11, p. 510). This substance when fed to rabbits in purified cotton-seed meal by way of the mouth or given intraperitoneally was fatal in every case in a few hours. When fed in corn meal and molasses it was uniformly lethal in from 9 to 16 days. A product precipitated from the gossypol extract with petroleum ether was also found to be poisonous. These properties of gossypol may explain why boiling alcoholic alkali removes the toxicity of cotton-seed meal and why iron salts act as an antidote for cotton-seed meal poisoning (E. S. R., 29, p. 477). The occurrence and properties of gossypol are being further studied.

J. B. Rather, associate referee on the testing of chemical reagents, reported on methods for the determination of nitrogen in crude caustic soda, MoO_3 in molybdic acid, and on solids of ethyl ether not volatile at 100°C . The associate referee on synthetic products, W. O. Emery, reported on mixtures containing caffeine and antipyrin. The work is to be continued.

The associate referee on balsams and gum resins, E. C. Merrell, gave a report on collaborative work on the lead number of gum asafetida. The method for determining the iodine number of Peru balsam is being studied further.

F. Rabak, associate referee on medicinal plants, presented a report on the physical constants of U. S. Pharmacopœia oils. E. K. Nelson read a paper on the estimation of santonin in Levant wormseed.

The associate referees on distilled liquors, meat and fish, water in foods, and cereal products were instructed to work along the same lines as at present.

The next meeting is to be held in Washington, D. C. The officers elected include as president, C. H. Jones, of Vermont; vice president, R. N. Brackett, of South Carolina; secretary-treasurer, C. L. Alsberg, of Washington, D. C.; and additional members of the executive committee, J. Hortvet, of Minnesota, and E. F. Ladd, of North Dakota.

American Society of Milling and Baking Technology.—The fourth annual meeting of this society was held at Washington, D. C., November 18, 1914. The program included reports of experiments with baking powders by Dr. T. J. Bryan, analytical tests by B. R. Jacobs, collaboration in milling by L. A. Fitz, and methods of baking by C. H. Bailey. Officers were elected as follows: R. Harcourt, president; R. W. Thatcher, of Minnesota, vice president; and J. A. LeClerc, of Washington, D. C., secretary.

EXPERIMENT STATION RECORD.

VOL. XXXII.

MARCH, 1915.

No. 4.

A few years ago a speaker at a meeting of the Association of American Agricultural Colleges and Experiment Stations declared that the great need of the experiment stations was for thoughtful reflection and consideration—the opportunity for deliberation and study. The need is as great to-day as it was then, possibly more so. It is one of the handicaps which remains to be corrected.

While there has been considerable progress toward a differentiation of duties and of personnel in our colleges and stations, the protection of the investigator from distractions and interruptions, and from demands of many kinds outside his special field, is still quite incomplete. The effects of it are a heavy burden on our research activity, a load it seems hard to shake off. The result is reflected in the nature of the work, the extent of its constructive character, the degree of its completeness and finality as far as it goes. The growth of the agricultural work and of appropriations for it has not always meant a correspondingly larger opportunity for substantial investigation. It has been so rapid and many-sided that concentration in station work has been difficult and often impossible for men of broad interests and sympathies. How to free station men from the effects of this enlarged activity in the college without divorcing them too completely from it, and thus depriving them of the suggestion and inspiration it may bring, is a vexed question.

For one thing, the station men are in the midst of the whole turmoil of college activity, and hence are drawn into it or affected by it unless they have unusual powers of concentration. And most men lack that power or ability; it is pointed to as one of the defects of our present training, and it is noticeable in station work because the need of it there stands out so prominently. It is a power to be studiously cultivated and encouraged, especially in those to whom the acquisition of knowledge is assigned. Failure to do this has led men to acquire standards which are a serious handicap as productive investigators. The habit of doing many things, of starting more than can be properly carried on, of having a hand in a great variety of enterprises, of being in close touch with many people within and without the institution, of having a large correspondence

to which personal attention is thought necessary to prevent disappointment, leads to a scattering of energy, a dissipation of time, and a lack of serious attention to the matters under investigation. It can not be otherwise.

If research is, as has often been said, an attitude of mind, it is an attitude of sound inquiry, of thoughtful consideration, of concentration of all the powers for the time being upon the subject in hand. It is an intellectual product, in which the things actually done are a resultant of the reasoning that lies back of the doing. It is a searching process, directed by reasoning from a well founded hypothesis, and carried forward by the accumulation of facts and their correlation in a manner to establish a truth. Hence, it calls for attentive study at all stages, and applies to all kinds of inquiry. The grade will affect the intensity but the essentials must be present if the effort is to be productive. Investigation or experiment or any form of inquiry which is not accompanied by thoughtful consideration is little more than routine, and can establish little.

As a speaker at one of our station meetings a few years ago said: "To get an intelligible and decisive answer of nature requires more than zeal or hard work. It needs hard thought and wide knowledge in framing the question. It needs what Lowell has called the 'unsullied temper of a well taught mind.'" To meet this need fragments of time, periods subject to frequent interruption, intervals when confusion and commotion prevent concentration, are far from being sufficient. And because they are not sufficient, and because conditions do not afford more opportunity for seclusion or it is not insisted upon, results are sometimes accumulated without being studied, and finally published without proper digestion, in the mistaken idea that they are a record of investigation.

The taking of records is not all of investigation but a means to it, an essential step in it. The records may often be made by a careful assistant who faithfully follows directions, but if anything vital comes of them it will be through a critical study which weighs cause and effect, correlates the new data with reference to an idea or hypothesis, and derives from them the facts they prove or a new point of departure. This comes from close work, a sinking of oneself into the subject, a thorough mastery of the facts, and their logical interpretation. It requires time and concentration.

The experience of a typical research institution, the Carnegie Institution of Washington, has unusual interest in this connection. In the thirteen years of its existence it has entertained proposals for research "in nearly every imaginable field of abstract thought and of applied knowledge," and has actually undertaken a limited number of investigations of its own. Out of its wide and complex experience

it has formulated a number of generalizations in regard to the qualities of research and the conditions favorable to it.

In the last report of the Institution its president, Dr. R. S. Woodward, says: "It is in evidence—

"1. That it is inimical to progress to look upon research as akin to occultism and especially inimical to mistake able investigators for abnormal men. Successful research requires neither any peculiar conformity nor any peculiar deformity of mind. It requires, rather, peculiar normality and unusual patience and industry.

"2. That fruitful research entails, in general, prolonged and arduous if not exhausting labor, for which all of the investigator's time is none too much. Little productive work in this line may be expected from those who are absorbingly preoccupied with other affairs. Herein, as well as in other vocations, it is difficult to serve two or more exacting masters.

"3. That those most likely to produce important results in research are those who have already proved capacity for effectiveness therein and who are at the same time able to devote the bulk of their energies thereto. In general, men are not qualified for the responsibilities of research until they have completed independently and published several worthy investigations.

"4. That research, like architecture and engineering, is increasingly effective in proportion as it is carefully planned and executed in accordance with definite programs. A characteristic defect of a large majority of the proposals for research submitted to the institution is a lack of tangible specifications. Estimates, especially of time and funds essential to carry out such proposals, are almost always too small. Those commonly made, even by skilled investigators, may be on the average safely doubled.

"5. That, in spite of the most painstaking foresight, research tends to expand more rapidly and hence to demand a more rapid increase of resources than most other realms of endeavor. Its unexpected developments are often more important than its anticipated results, and new lines of inquiry often becomes more urgent than those carefully prearranged for pursuit.

"6. That it is much easier, in general, to do effective work of research in the older fields of inquiry than in the newer ones. It is especially difficult to enter those fields in which there is as yet no consensus of opinion concerning what may be investigated and what criteria may be followed. In some of the older fields, however, like the so-called humanities, for example, there is at present no such consensus of opinion, if one may judge from the large mass of expert but hopelessly conflicting testimony furnished to the Institution by its correspondents. In such fields it appears now practicable to proceed only in a somewhat arbitrary fashion, accomplishing here and

there good pieces of work regardless of divided opinions or even in opposition to expert advice."

Some of these views will sound very familiar, for they coincide so fully with experience in agricultural research. A well-known result with the Institution has been the establishment of departments of its own in order to secure the conditions found necessary to research, and a great restriction of the assignment of grants for work outside. In other words, even this institution, with freedom of purpose and action, and with large means at its disposal, has early found it desirable to concentrate its efforts and resources upon a few chosen lines, and to anticipate their growing needs.

It is recognized as impracticable for station men to restrict their efforts absolutely to the field and laboratory work connected with their investigations and experiments, or to have the full command of their time enjoyed by those in a private institution. Many will believe such a restriction is not wholly desirable, because of the nature and relationships of the work. But it seems clear as time goes on that a greater measure of relief from the effects of a too diverse program should be sought. This is especially the case now that the station's field is more sharply defined.

Such relief can often be effected by a more favorable division or adjustment of the time of station workers, so as to give longer periods free from interruption; and by favorable environment—by arrangements which will protect the men by enabling a greater degree of seclusion at times, and often by a proximity of the investigator to the matters he is studying. And beyond this, through proper exercise of the administrative function men may be dissuaded or deterred from laying out too diffuse or ambitious programs. A part of the present difficulty often lies in the men themselves, a result of the experience they have passed through or of failure to acquire habits of concentration.

The conservation of the time of station men is to a considerable extent a matter of organization and of making definite provision for the various divisions of work. More might often be done to relieve station men of executive functions, from exacting requirements connected with the academic life of the college, and from duties which should be cared for by the extension force. If men who are primarily investigators are on the program for a limited amount of instruction, this can be so arranged as to come at a convenient part of the year or of the day, to avoid interruption; and if it then proves too much of a burden or distraction, the wisest course may be to make other provision for it, recognizing that in the case of a competent investigator the instruction he gives is of secondary importance and should not be permitted to interfere with his primary function.

The investigator should be protected also in a certain measure of seclusion or freedom from unnecessary intrusion. How much the effect of interruption means to the average man is rarely estimated, especially by those not of his kind or temperament. It leads men to establish office hours, to withdraw themselves from public approach, and sometimes results in their being regarded as exclusive or even sharply criticized or censured, especially those connected with agricultural institutions. The idea that men are protected from those they seek to serve, or that they should close their doors to callers, is not popular and is not understood. But the clientele of the agricultural work is now so large and the expectations of various kinds of service so extensive that the problem of saving some time of the station force for concentrated effort often becomes acute.

The sapping of mental and nervous energy comes less rarely from continuous and close application than from distractions, interruptions, the constant readjustment and attempt to gather up lines of thought that have been broken in upon. Some of the world's greatest workers have felt the benefit of getting away from the center of activity for brief periods—of a retreat to which they could flee for periods of reflection, where they would be free from interruption and distraction.

Again, the phenomenal growth of the agricultural colleges, the increasing size of the plant, and the even larger plans for development, have steadily pushed the experimental fields, the greenhouses, stables, etc., farther and farther away from the center of things, making it more of an effort to spend time there or visit them. The first duty draws toward the office, where the hum of business and appointments occupy day after day. The men are so easily accessible there that interruptions are well-nigh inevitable and the time is shattered and energies dissipated.

We have excelled in designing and erecting large buildings, with well-appointed offices and laboratories and class rooms, located within the academic group of the university or college. We take just pride in these as showing the splendid provision that has been made for teaching and for investigation in agriculture, and the integral part it now forms in the life of the whole institution. They are a great acquisition, and add greatly to the facilities for the inside work. But they doubtless intensify some of the present difficulties as the work of the institution grows.

Here the investigators for the most part have their headquarters and spend most of their time, confined by the nature of their miscellaneous duties and the distance from the live part of their experimental work. In a number of instances the extension of the college campus has removed the experimental plats and fields, and in some cases the stables, a mile or more from the offices, and often requires

the provision of special facilities for reaching them. An inevitable result is much loss of time and often neglect, or the leaving of an essential part of the work to subordinates.

In a paper before the Society for the Promotion of Agricultural Science last November, Mr. David Fairchild, of this Department, made a forceful plea for the small laboratory in agricultural investigation, and drew an attractive picture of its advantages and the favorable atmosphere it engenders. Starting with the generalization that most discoveries in agriculture are the result of concentrated study, and that most men have not the ability to become oblivious to what is going on about them in a noisy building occupied by student classes, he strongly emphasized the necessity for uninterrupted periods of quiet as conducive to productive investigation and discovery. He likened the wasted energy in the stopping and starting of a train of thought to that in the stopping and starting of a locomotive, affirming that "the deeper the degree of concentration the longer it takes to pick up the train of thought after an interruption." He cited examples of the fatiguing effect of such interruption, and of its sometimes leading to the abandoning for the time being of attempts to prosecute the particular study in hand.

For the study of growing plants particularly the advantage of the small laboratory in close proximity to the material was well illustrated. Such a laboratory or simple shelter is located in the midst of the things that are to be studied. Here the investigator is on the firing line. The forces and material to be studied come directly under observation. The range of possible events is so narrow that every occurrence throws light on the problem in hand rather than merely alluring the investigator into other tempting fields. There is nothing to distract or confuse the mind, all sounds or sights are part of the problem or bear upon it. The very breath of freshness on the material to be studied brings inspiration and suggestion as well as accuracy of observation.

Again, Mr. Fairchild considered the effects of large laboratories upon the men working in them, and the development of the laboratory routine habit of life and thought. He maintained that "our great laboratories are invaded more than we perhaps realize by the executive atmosphere, and their very size and the fact that they are under one roof make this invasion almost unavoidable." It is true also that our large laboratories have sometimes served to gratify an innate taste for collecting apparatus which does not always improve them as workshops, robs men of their resourcefulness, and sometimes occupies them in dilettante manipulation. The very completeness of equipment may induce a comfortable satisfaction which is fatal to the spirit of investigation. Instances could be cited in which the com-

pletion of the laboratory and its equipment practically marked the end of the productive activity of an investigator of apparent promise.

Some of the advantages of the small field laboratory over the larger ones were summed up by Mr. Fairchild as follows: The uninterrupted periods of quiet which are prerequisites to an atmosphere of research; nearness to the plants under observation; possibility of spending easily and without unusual effort the early mornings among plants one is studying; a place to take a colleague and discuss without fear of interruption the problems which one is at work upon. "We are not alone enough it seems to me," he said, "and this suggestion is made in the interest of those who crave time in which to think and be quiet."

For the best interests of station work, men must be selected because of their love for it and their desire and ability to concentrate effectively upon it. The investigator and his problems must be brought together, opportunity and encouragement given to stay together, and concentration and thorough study expected. Then results may be looked for, and if they do not follow after reasonable time, it will be easier to determine where the difficulty lies.

RECENT WORK IN AGRICULTURAL SCIENCE.

AGRICULTURAL CHEMISTRY—AGROTECHNY.

Encyclopedia of technical chemistry, edited by F. ULLMANN (*Enzyklopädie der technischen Chemie. Berlin and Vienna, 1914, vol. 1, pp. X+814, figs. 295*).—The initial volume of this work, which lists the topics from the letters A to Ä, respectively. The text contains descriptions of the technical processes, including in many instances the engineering features pertaining thereto. The topics are reenforced by a bibliography and cross references.

A popular treatise on the colloids in the industrial arts, K. ARNDT and N. E. KATZ (*Easton, Pa., and London, 1914, pp. VI+73*).—This book deals in a popular manner with the chemistry of colloids, with particular reference to its industrial applications. Among a number of other sections are brief sections on sewage purification and colloids in agriculture with reference to soil fertility.

Chemical technology of the textile fibers, K. STIRM (*Chemische Technologie der Gespinnstfasern. Berlin, 1913, pp. XVI+410, figs. 54*).—This edition contains, in addition to other cuts, 22 original photogravures. Some of the topics dealt with are textile fibers (classification and differentiation), mineral fibers, vegetable fibers, fibers of animal origin, artificial fibers, and the dyeing and printing of fibers.

The textile fibers, J. M. MATTHEWS (*New York and London, 1913, 3. rev. ed., pp. 630, figs. 141*).—This is the third edition of this book which deals with the physical, microscopical, and mechanical properties of textile fibers.

Plant micro-chemistry, O. TUNMANN (*Pflanzenmikrochemie. Berlin, 1913, pp. XX+631, figs. 137*).—This is an aid book for the study of plant objects, with special emphasis on the micro-chemical detection of plant constituents.

Nutritional physiology of the yeast cell during alcoholic fermentation, M. RUBNER (*Die Ernährungsphysiologie der Hefezelle bei alkoholischer Gärung. Leipsic, 1913, pp. IV+396, figs. 40*).—This study considers vital and fermentative changes, the physiological energy requirements of yeast during the inhibition of growth, the growth of yeast with regard to the amount of nourishment, methods of feeding and temperature, the absolute fermenting power of growing and nongrowing yeast and the energy relations between fermentation and growth, heat of fermentation and other heat regulations in yeast, the relation of the energy and food metabolism when compared with other organisms, the rôle of the cell membrane as a resorption surface for foodstuffs, and the nitrogen metabolism of growing and nongrowing yeast.

Tests on the inhibiting action of poisons upon micro-organisms.—IV, Action of fluorin compounds upon *Merulius*, mold formation, putrefaction, and fermentation, C. WEHMER (*Chem. Ztg., 38 (1914), Nos. 11, pp. 114, 115; 12, pp. 122, 123*).—The tests reported upon were made for the purpose of determining the disinfecting capacity of chemical substances employed in everyday practice, and such as are recommended as suppressors of micro-organisms.

The experiments were conducted with montanin, which is an aqueous solution, strongly acid, and almost odorless, having a specific gravity of 1.3502 (38.1° Baumé at 15° C.). It consists essentially of a solution of free silicofluoric acid (about 23 per cent) and zinc aluminum silicofluorid (20 to 30 per cent). Hydrofluoric acid and hydrofluosilicic acid are considered good preservatives, especially for wood.

The coloring matters of blossoms and fruits, R. WILLSTÄTTER (*Sitzber. K. Preuss. Akad. Wiss.*, 1914, XII, pp. 402-411; *abs. in Chem. Ztg.*, 38 (1914), No. 48, p. 516).—A number of anthocyanins of blossoms and fruits were isolated in a crystalline condition. They are considered sugar combinations of coloring matters and are recognized as hydroxyl combinations of a phenylbenzopyrylium. The anthocyanins are chinoids of oxonium salts. They form a new class of plant bases whose basic nature is due to tetravalent oxygen.

The constituents of *Solanum angustifolium*: Isolation of a new gluco-alkaloid, solangustin, F. TUTIN and H. W. B. CLEWER (*Jour. Chem. Soc. [London]*, 105 (1914), No. 617, pp. 559-576).—In Peru, Bolivia, Paraguay, and the southern portion of the Province of Buenos Aires, Argentina, a solanaceous plant occurs which is known as "Duraznillo Blanco," and identified as *S. angustifolium*. It is employed in South America as a febrifuge, chiefly in the treatment of enteric fever. In Peru it is also used in cases of malaria, but with caution, on account of its reputed poisonous properties.

In the work reported, "from the portion of the extract which was soluble in water there were isolated the following substances: (1) Quercetin; (2) rutin, $C_{27}H_{30}O_{16} \cdot 3H_2O$; (3) l-asparagin; (4) a new gluco-alkaloid, solangustin, $C_{33}H_{53}O_7N \cdot H_2O$. On hydrolysis, solangustin yields solangustidin, $C_{27}H_{43}O_2N$, together with one molecule of dextrose. The aqueous liquid also contained small amounts of amorphous, alkaloidal material, and a considerable quantity of a sugar, which apparently was levulose, together with viscid, amorphous products. Some of the latter yielded quercetin and 3:4 dihydroxycinnamic acid on treatment with alkalis.

"The portion of the original extract which was insoluble in water yielded, in addition to much chlorophyll and resinous material, the following compounds: (1) Triacontane, $C_{30}H_{62}$; (2) a phytosterol, $C_{27}H_{46}O$; (3) a phytosterolin (phytosterol glucosid), $C_{33}H_{56}O_6$; (4) palmitic, stearic, cluytinic, and cerotic acids, together with a mixture of linoleic and linolenic acids. It furthermore gave a small amount of the above-mentioned new gluco-alkaloid, solangustin, and a higher fatty acid, which was either melissic acid, $C_{30}H_{60}O_2$, or a lower homologue, $C_{28}H_{56}O_2$.

"An amount of the total alcoholic extract, equivalent to 3.5 gm. of the drug, and 0.48 gm. of solangustin were separately administered to a dog, but no perceptible effect of any kind resulted. The amorphous alkaloidal material, which occurred to a small extent in the plant, yielded a similarly negative result."

Refractometry, I and II, G. A. SHOOK (*Metallurg. and Chem. Engin.*, 12 (1914), Nos. 9, pp. 572-576, figs. 3; 10, pp. 630-635, figs. 10).—Part 1 of this article deals with the fundamental principles of refractometry. Part 2 considers in detail the various instruments used in refractometry (butyro, Abbe, Zeiss immersion, Pulfrich, and Fery refractometers) and the principles underlying their use.

Determination of nitrogen by the Kjeldahl method with the aid of vanadium pentoxid, OEFELE (*Pharm. Zentralhalle*, 52 (1911), No. 42, pp. 1121, 1122).—For each digestion 0.1 gm. of vanadium pentoxid is employed instead of other oxygen transmitters. Care must be exercised at the outset in heating in order to prevent overfoaming.

New modification of the Kjeldahl method, L. MARINO and F. GONNELLI (*Atti R. Accad. Lincei, Rend. Cl. Sci. Fis., Mat. e Nat.*, 5. ser., 23 (1914), I, No. 7, pp. 523-530; *abs. in Jour. Chem. Soc. [London]*, 106 (1914), No. 621, II, pp. 575, 576).—When vanadium pentoxid was used as a catalyst in the Kjeldahl process, according to the suggestion of Oefele (see above), an error of about 1 per cent was noted. Accurate results may be obtained, however, if 1 gm. of the organic substance is boiled with 20 cc. of concentrated sulphuric acid, 7 gm. of potassium sulphate, and 0.2 gm. of vanadium pentoxid until an emerald green colored solution is obtained. The method can be used to advantage in cases where the Gunning modification of Kjeldahl's method does not suffice to convert the nitrogen into ammonia.

About the decomposition of large amounts of organic substances according to the Kjeldahl method, E. CARPIAUX (*Bul. Soc. Chim. Belg.*, 27 (1913), No. 12, pp. 333, 334; *abs. in Chem. Ztg.*, 38 (1914), No. 26, *Repert.*, p. 114).—Usually as little as 5 gm. of substance is hard to oxidize in the Kjeldahl flask, even with boiling sulphuric acid. The method utilized by the author for the oxidation of from 20 to 30 gm. of organic substance is as follows: About 30 gm. of the substance to be examined is placed in a Kjeldahl flask with about the same amount of sulphuric acid, agitated thoroughly, and allowed to stand for about one hour. If at the end of this period the mass is dry enough, there are added mercury and enough sulphuric acid for oxidation, which is completed in a few minutes. Although large amounts of sulphuric acid affect the nitrogen and phosphoric acid, injury may be prevented by the addition of sugar. In the resulting solution nitrogen, phosphoric acid, and calcium can easily be determined.

A simplification of Bang's micro-Kjeldahl method and the protein content of the vitreous humor of rabbits' and dogs' eyes, M. KOCHMANN (*Biochem. Ztschr.*, 63 (1914), No. 4-6, pp. 479-482).—Bang's method^a consists of placing 100 mg. of blood in a 50 cc. Kjeldahl bottle with 1.5 cc. of pure sulphuric acid, 3 to 4 drops of 10 per cent copper sulphate solution, and 2 pieces of potassium sulphate about the size of a millet seed, and heating on a wire gauze until the decomposition is complete. After cooling, 10 cc. of distilled water is added, then 10 cc. of 20 per cent potassium hydroxid, the mixture cooled, and 10 cc. more of potassium hydroxid solution added. The Kjeldahl flask with its contents is then connected to the Bang distillation apparatus, which consists of an expanded tube plugged with a wad of glass wool for the purpose of preventing the passage of potassium hydroxid over into the distillate during distillation. This tube is connected at its lower end to the Kjeldahl bottle with a perforated rubber cork, and at its upper end with a bent quartz tube which contains at its outlet a small copper condenser. The distillate is collected in a 50 cc. beaker containing from 3 to 10 cc. of centinormal hydrochloric acid solution. The hydrochloric acid not neutralized by the ammonia is determined by titration with centinormal thiosulphate solution, after adding starch paste, a few drops of a 2 per cent potassium iodate solution, and 2 or 3 crystals of potassium iodid.

The author found it a disadvantage to operate with the wide distillation tube and preferred to titrate the unused standard acid (hydrochloric or sulphuric) with a centinormal sodium hydroxid solution, using cochineal as the indicator. The quartz tube may be replaced by a hard glass tube.

Nephelometry in the study of nucleases, P. A. KOBER and SARA S. GRAVES (*Jour. Amer. Chem. Soc.*, 36 (1914), No. 6, pp. 1304-1310, *figs.* 2).—A description

^a *Biochem. Ztschr.*, 49 (1913), No. 1-2, pp. 19-39, *figs.* 4; 51 (1913), No. 3, pp. 193-199, *fig.* 1.

of a new method for estimating undigested nucleic acids, which consists in adding a precipitant to a dilute solution of the nucleic acids and estimating the resulting suspensoids nephelometrically (E. S. R., 30, p. 410).

The results show that "the nephelometer can be used for the study of digestion of yeast nucleic acid when a 0.2 per cent solution acid egg albumin is used as a precipitant. This reagent is not appreciably affected in dilute solutions by most substances met with in physiological work, and will easily detect one part yeast nucleic acid in 1,000,000 parts of water."

New methods of soil analysis and the estimation of colloids in soils, R. VAN DER LEEDEN and F. SCHNEIDER (*Internat. Mitt. Bodenk.*, 2 (1912), No. 1, pp. 81-109; *abs. in Zentbl. Agr. Chem.*, 42 (1913), No. 3, pp. 145-147; *Jour. Chem. Soc. [London]*, 104 (1913), No. 607, II, pp. 433, 434).—Some experiments with soils resulting from the weathering of gneiss showed "that for the comparison of the hygroscopicity of a soil with that of the silicates dissolved by hydrochloric acid, extraction with aqueous hydrochloric acid is unsuitable, since the solution of colloidal silica, its precipitation with adhering oxids of iron and aluminum and other dissolved substances, introduce errors. The acid may also dissolve colloids which possess only slight hygroscopicity; this could be avoided by employing gaseous hydrogen chlorid.

"The assumption that the absorption of dyes rises and falls with the amount of colloids is not accepted. Exact experiments on the absorption of dyes and hygroscopicity can only be made when the surfaces of the soils are estimated on the one hand by the employment of a dye solution and on the other by using the vapors of organic substances of high molecular weight.

"The results of analyses as well as estimations of hygroscopicity indicated that unweathered minerals are dissolved by hot hydrochloric acid."

The estimation of the lime requirement of soils by means of the hydroxid of the alkaline earths, C. R. MOULTON and P. F. TROWBRIDGE (*Jour. Indus. and Engin. Chem.*, 6 (1914), No. 10, pp. 835-837).—"A brief survey of the data presented seems to establish the fact that the lime requirement found by the method of Bizzell and Lyon [E. S. R., 30, p. 422] is proportionate to the barium hydroxid used and not to the acidity of the soil. The lime requirement is considerably lower than when the Veitch method is used. The lime requirement varies with the length of time of the distillation and volume of distillate until a zero lime requirement is obtained.

"No consideration of the speed of a method is worth while when its performance is such as is indicated by this study. However, the experience in this laboratory shows that at least as much attention on the part of the operator is needed for the method of Bizzell and Lyon as for the Veitch method. The time consumed in evaporating, and so forth, does not enter into consideration when a chemist has other work in progress."

A comparative compilation of reactions for detecting nitrites in drinking water, M. BORNAND (*Mitt. Lebensm. Untersuch. u. Hyg., Schweiz. Gsundtsamt.*, 4 (1913), No. 5, pp. 285-289; *abs. in Chem. Ztg.*, 38 (1914), No. 32, *Repert.*, p. 146).—Neutral red (Rochaix's reagent) is deemed unsatisfactory for detecting nitrites in drinking water, and Denigès' strychnin sulphate reagent is considered impracticable for use under the usual laboratory conditions because it decomposes very easily. The resorcin-sulphuric acid test of Barbet and Jandrier, the indol test of Mnoucha Chwilewizky, and the Van Hoesva-Lunge sulphanilic acid method are deemed the most reliable.

The bacteriological examination of food and water, W. G. SAVAGE (*Cambridge, England, 1914*, pp. VIII+173, *figs. 16*).—Books on pathological bacteriology as a rule do not adequately supply methods for the examination of water, air, foods, and the like. This book, which is one of the Cambridge Public

Health Series, edited by G. S. Graham-Smith and J. E. Purvis, is said to fill these requirements, and its contents are as follows: General methods for the isolation and identification of indicator organisms, water, soil and sewage, shellfish, milk, modified milk and milk products, the bacteriology of meat and meat products, air, and the determination of antiseptic and germicidal power. An appendix dealing with the composition of the culture media is included.

Fatty foods: Their practical examination, E. R. BOLTON and C. REVIS (*Philadelphia, 1913 pp. X+371, pls. 8, figs. 36*).—This handbook is intended for analytical and technical chemists and deals with general and special methods for the examination of foods and feeding stuffs containing fats. The contents are as follows: Beef fat, lard, butter, margarin, and ghee; vegetable oils and fats—special tests for oils and fish and marine animal oils; rancidity; cocoa, chocolate, and milk chocolate; feeding stuffs—methods of analysis and calculation of rations; and milk—analysis and examination for use in margarin, pasteurization, cleanliness and bacteriological condition, and cream and separated milk.

Methods for the biological examination of milk, J. BAUER (*Die Methodik der Biologischen Milchuntersuchung. Stuttgart, 1913, pp. XI+112, figs. 15*).—This small book deals principally with biological methods for examining milk, under the headings of methods for determining the animal from which the milk originates; determining heated milk; and determining the sanitary condition of milk. It is said to be the first book of its kind.

A method for the determination of fat in milk (nephelometric method), W. R. BLOOR (*Jour. Amer. Chem. Soc., 36 (1914), No. 6, pp. 1300-1304*).—"The procedure is as follows: One cc. of the milk, measured with an accurate pipette, is run slowly and with stirring into about 80 cc. of an alcohol-ether mixture (containing 3 parts of redistilled alcohol and 1 part of redistilled ether) in a 100 cc. graduated flask. (The measurement may be checked by determining the weight of the added milk.) The mixture is raised to boiling by immersion in a boiling water bath, cooled to room temperature, made up to 100 cc. with the alcohol-ether, shaken, and filtered. The filtrate is clear and almost colorless.

"For the determination, 5 cc. of the solution is run from a pipette, slowly with stirring, into 100 cc. of distilled water in a beaker, producing a slightly opalescent colloidal solution. The point of the pipette must be kept below the surface of the liquid during the outflow. A similar solution is prepared with 5 cc. of the standard fat solution. To the standard and to the test solutions are added, simultaneously, 10 cc. portions of dilute (10 per cent) hydrochloric acid and, after stirring, the solutions allowed to stand for five minutes, after which they are transferred to the comparison tubes of the nephelometer [E. S. R., 30, p. 410].

"For the comparison, the two tubes, filled to the same height with the solutions, are placed in the nephelometer with the standard tube always on the same side. If bubbles appear in the walls of the tubes they are removed by inverting two or three times. The movable jacket on the standard side is set at a convenient point, generally 50 mm. (Richards' nephelometer), and comparisons made by adjusting the jacket on the test solution until the images of the two tubes show equal illumination. At least five readings are taken, alternately from above and below, and the average taken as the reading. This reading is corrected from the calibration curve of the instrument and the fat value of the milk calculated from the corrected reading.

"The standard solution is an alcohol-ether solution of pure triolein, made with freshly distilled absolute alcohol and pure dry ether, of which 5 cc. contains about 2 mg. of fat." See also a previous note (E. S. R., 31, p. 610).

Where a nephelometer is lacking other colorimeters may be adapted to the purpose. In a table a comparison is made of the values obtained with human and cows' milk by the method proposed, the Babcock method, and also in some cases the Adams method. "The cows' milk was mixed dairy milk collected from various sources. The human milk samples were from cases in various early stages of lactation and were selected so as to obtain as wide range of fat values as possible."

A rapid method of estimating fat in cheese, cream, and butter, K. KROPAT (*Arch. Pharm.*, 252 (1914), No. 1, pp. 76-80).—It has been previously shown by Rupp and Müller^a that in the estimation of fat in milk the extraction may be facilitated by the addition of gum tragacanth. The method has now been extended to the estimation of fat in cream, cheese, and butter.

For cheese the procedure is as follows: From 2 to 3 gm. of cheese is heated with 5 cc. of 25 per cent hydrochloric acid until dissolved. The solution is then treated with from 3 to 5 cc. of alcohol, and after cooling is shaken with 25 cc. of ether. When the separation is complete 25 cc. of light petroleum ether is added and allowed to stand for 15 minutes. Then are added from 1 to 1.5 gm. of gum tragacanth and 3 to 5 cc. of water, and after swelling of the gum the ethereal layer is allowed to separate and the residue washed with light petroleum ether. The fat is determined in the extract by evaporation in the usual manner.

A similar method is adopted for cream and butter.

Material for uniform laws regarding foodstuffs.—IV, Cheese (*Entwürfe zu Festsetzungen über Lebensmittel.—IV, Käse. Sup. to Ztschr. Untersuch. Nahr. u. Genussmtl.*, 26 (1913), No. 6, pp. 30).—Besides describing the various kinds of market cheese, this pamphlet outlines methods for determining the moisture, fat, protein, and ash content of cheese and the detection of the presence of preservatives, such as boric, salicylic, benzoic, and other acids.

Ethyl ester of linoleic tetrabromid as a product in the analysis of cotton-seed oil, L. S. PALMER and P. A. WRIGHT (*Jour. Indus. and Engin. Chem.*, 6 (1914), No. 10, pp. 822, 823).—In the course of some studies on the composition of cotton-seed oil, in which the unsaturated acids were being isolated by the Tortelli and Ruggeri method^b making use of the solubility of their lead soaps in ether and finally recovering the linoleic acid as the tetrabromid, large clustering needles were obtained instead. These needles melted at 58 to 58.5° C. and the crystals showed a much greater solubility in 95 per cent alcohol, glacial acetic acid, petroleum ether, etc., than linoleic tetrabromid. The crystals from all of the solvents were obtained in the same form and had the same melting point, which was strikingly similar to the melting point of the tetrabromid of the isomeric telfairic acid of Thoms. The ethyl ester of linoleic tetrabromid also has a melting point nearly identical with the melting point of the tetrabromid of the isomeric telfairic acid.

"The results reported present several points of interest. In the first place, it appears that in isolating the unsaturated acids of cotton-seed oil by the lead soap ether method, some care is required not to allow the lead soaps to stand under ether if the product desired is ordinary linoleic acid or its bromid. In the second place, there is opened up a field of new products of the unsaturated acids, namely, the esters of the bromids. Heretofore esterification has been confined to the acids themselves.

"The authors have prepared a few of these bodies, namely, methyl bromolinolate and the methyl and ethyl esters of oleic dibromid. They found the

^a *Ztschr. Untersuch. Nahr. u. Genussmtl.*, 23 (1912), No. 7, pp. 338, 339.

^b *Orosi*, 23 (1900), No. 1, pp. 109-122.

methyl ester of linoleic tetrabromid to crystallize from alcohol in white glistening plates resembling the ethyl ester. The slightly impure crystals melted between 50 and 56°. The two esters of oleic dibromid were found to be yellow oils, very soluble in most solvents, but very little soluble in their corresponding alcohols saturated with HCl gas.

"At present actual analysis of cotton-seed oil for linoleic acid falls far short of the theoretical value indicated by the iodine value of the oil or the mixed unsaturated acids. It is hoped that the case with which esters of the bromids of the unsaturated acids are formed, especially linoleic acid, may eventually be of value in clearing up the composition of cotton-seed oil."

A new method for determining crude fiber, H. STIEGLER (*Jour. Landw.*, 61 (1913), No. 4, pp. 399-426, figs. 6).—The studies were made with barley and its dregs for the purpose of obtaining a method of determining crude fiber which is more exact and free from the objections raised to previously described methods.

In the method the material is treated with concentrated hydrochloric acid in the cold for ridding the substances of complicated colloids, and is as follows: From 1.5 to 3 gm. (according to the amount of crude fiber present in the material) is ground to a flour-like consistency and placed in a 300 cc. Soxhlet flask, such as is used for milk sterilization, and containing 20 cc. of distilled water. After thorough distribution of the meal 60 cc. of concentrated hydrochloric acid (specific gravity 1.19) is added and the mixture allowed to stand for 10 minutes. It is then made up to 200 cc. with boiling water, placed in the boiling water bath of an inverting pot, and heat applied, at the same time a current of air being passed slowly through the mixture. After heating for exactly one hour the insoluble mass in the flask is allowed to settle and the supernatant fluid is drawn off by a device which is illustrated. The residue in the flask is neutralized with 50 cc. of a 5 per cent potassium hydroxid solution, made up to 200 cc. with boiling water, and placed in the boiling water bath for one-half hour, circulating air through it as before. The hot alkaline solution is then brought on a Gooch crucible (4.5 cm. high and with an upper diameter of 4 cm.), and filtered through a disk of heated asbestos paper which is covered with a layer of washed asbestos fiber. The residue on the filter is washed with 500 cc. of hot water, then with alcohol, and finally with ether, and allowed to stand for one-half hour; the ether removed with the suction pump, dried for two hours at from 100 to 105° C., and weighed. The fiber is ashed in a special device which is illustrated.

New agreement about malt analysis, G. BODE and A. WLOKKA (*Ztschr. Gesam. Brauw.*, 37 (1914), Nos. 29, pp. 372-374; 30, pp. 384-386; *abs. in Amer. Brewers' Rev.*, 28 (1914), No. 9, pp. 430-432).—A plan for the unification of methods for malt analysis, as submitted to the German Chemical Society by the section on fermentation chemistry.

The methods which are given in this report were tested out cooperatively during the course of two years. They consist of those for sampling, crushing, and determining the fineness of crushed malt, moisture, extract, saccharification, and color of the wort. The physical examination is for the condition of the meal body, 1,000 kernel (berry) weight, and hectoliter weight. The length of the acrospire is not to be determined. A blank for reporting results is shown.

The American Leather Chemists Association, 1914 (*Amer. Leather Chem. Assoc. [By-laws, etc.]*, 1914, pp. 38).—This yearbook contains the official and provisional methods of analysis of tannin, tanning materials, leather, fats, and oils, and the by-laws of the association.

Copra drying. C. W. HINES (*Philippine Agr. Rev.* [English Ed.], 7 (1914), No. 8, pp. 323-326, pl. 1).—Coconuts are grown extensively in 16 Provinces of the Philippines and supply about one-third of the world's output of dried copra. Modern methods of drying the copra and extracting the oil are not used, and the greater part of the copra produced is of poor quality on account of the inferior methods of handling and drying. Aside from the objectionable dark color of the copra, which is caused by long drying, the large amount of moisture retained favors the development of molds and bacteria, which give the product an unfavorable appearance, and reduces the percentage of oil considerably.

The several driers previously used in this work are briefly discussed, and the proper method of drying is described.

As regards the manufacture of oil it is pointed out that "the percentage of oil contained in the fresh meat of the coconut usually runs from about 30 to 45 per cent. The percentage contained in the dried product will be largely governed by the percentage of moisture remaining. It will, of course, contain a lower percentage of oil than the oven-dried, which will often reach 70 to 80 per cent when its moisture content has been greatly reduced.

"There are two processes commonly used in extracting this oil—the hydraulic and the continuous. The former usually gives higher extraction but is slower in operation than the latter. . . . The press cake remaining after the oil is removed makes a valuable cattle feed and also an excellent fertilizer."

Yearbook of the societies of alcohol manufacturers, starch interests, and potato driers in Germany, edited by G. FOTH (*Jahrb. Ver. Spiritus Fabrik. Deut.*, 14 (1914), pp. XXIII+573).—Discussions of these societies and reviews, with particular reference to the advances made in these industries during 1913.

METEOROLOGY.

Climatic provinces of the western United States, W. G. REED (*Bul. Amer. Geogr. Soc.*, 47 (1915), No. 1, pp. 1-19, figs. 4).—It is stated that the published climatic provinces of the western United States are not satisfactory, and a new grouping into two provinces is suggested, (1) a Pacific province which includes all the region west from the Cascade, Sierra Nevada, and Peninsular mountains to the Pacific Ocean, and (2) a rain shadow area which includes the region east from this crest-line to the eastern boundary (left undetermined) of the region under discussion.

The underlying idea in this grouping is to divide the region in such a way that areas with similar climatic conditions shall fall within the same general group and that those with essentially different climatic conditions shall be kept separate. The outstanding difference between the groups is that "the Pacific province is characterized by marked subtropical winter rains and dry or nearly dry summers; the rain shadow area has large diurnal and annual ranges of temperature and generally deficient precipitation."

Geographical aspects of climatological investigations, B. C. WALLIS (*Scot. Geogr. Mag.*, 30 (1914), No. 7, pp. 356-369, figs. 5).—An attempt is made to show the utility in the teaching of geography of the method of differences as illustrated in the normal and variations from it of temperature and rainfall.

Principia atmospherica: A study of the circulation of the atmosphere, W. N. SHAW (*Proc. Roy. Soc. Edinb.*, 34 (1913-14), No. 1, pp. 77-112, figs. 4).—This article deals with recent developments of the science of meteorology, particularly in the investigation of the upper air, presenting knowledge of atmospheric circulation "in the normal scientific form, with axioms which represent inductive laws, with postulates or lemmas which represent groups of observed

facts, and with propositions leading to conclusions which are susceptible of verification."

The moon and autumn storms, E. HINSELMANN (*Hansa*, 51 (1914), No. 26, pp. 607-609).—An attempt is made in this article to correlate weather changes, especially storm periods, with phases of the moon, with a view to verifying the accuracy of predictions based upon such correlation.

Types of storms of the United States and their average movements, E. H. BOWIE and R. H. WEIGHTMAN (*Mo. Weather Rev. Sup. 1* (1914), pp. 37, pls. 114).—This is the first of a series of supplements to the *Monthly Weather Review* dealing with some of the more elaborate contributions of the Weather Bureau to meteorology. It deals with the origins of storms, describes ten different storm types, and discusses in detail the use of the knowledge of these types in weather forecasting.

A select bibliography on weather forecasting suited especially for beginners in this field of meteorology is also given.

Climatological data for the United States by sections (*U. S. Dept. Agr., Weather Bur. Climat. Data*, 1 (1914), Nos. 9, pp. 224, pls. 2, figs. 7; 10, pp. 224, pls. 2, figs. 8).—These volumes contain, respectively, brief summaries and detailed tabular statements of climatological data for each State for September and October, 1914.

Meteorological data, T. CROMIE (*Ann. Rpt. Dept. Agr. Saskatchewan*, 9 (1913), pp. 159-190, figs. 2).—The weather conditions for each month of 1913 are briefly summarized, and data for temperature and precipitation at different places in Saskatchewan are given in tables and compared with similar data for previous years. A table is also given which shows the precipitation, mean temperature, and wheat yield for the years ending September 30, 1901-1913.

Meteorology [of New South Wales], J. B. TRIVETT (*N. S. Wales Statis. Reg.*, pt. 4 (1913), pp. 345-400).—This is a report consisting of detailed tabular statements showing observations on atmospheric pressure, temperature, precipitation, humidity, and wind movement at Sydney and other places in New South Wales during 1913 and a number of preceding years.

[The climate of New South Wales], J. B. TRIVETT (*Off. Yearbook N. S. Wales*, 1913, pp. 40-53).—The principal climatic features of New South Wales are briefly described.

SOILS—FERTILIZERS.

The Clyde series of soils, J. A. BONSTEEL (*U. S. Dept. Agr. Bul. 141* (1914), pp. 60, pls. 10, fig. 1).—This bulletin deals with the origin, characteristics, and crop adaptabilities of the Clyde series of soils, which occurs within the territory immediately to the south of the Great Lakes and covers an aggregate area of 1,877,700 acres. The series is divided into 11 different soil types ranging from gravelly sand to clay, and includes types with dark colored surface soils, usually well filled with organic matter, underlain by gray or mottled subsoil. The deeper subsoils of the finer grained types are usually calcareous.

The soils of this series "have been formed as glacial lake sediments, as terrace deposits along glacial stream ways, and as accumulations in small ponds, lakes, or in other positions of obstructed drainage within the glaciated region of the northern United States. . . . [and] are chiefly found in level or depressed areas within the glacial lake and river terrace province. . . . The different soils were usually swampy or very poorly drained in their natural condition."

Sugar beets are said to be the most important special crop, but corn, oats, hay and truck crops are also grown on the better drained areas.

It is stated that drainage is the most important of all forms of soil improvement upon the soils of this series.

The Miami series of soils, J. A. BONSTEEL (*U. S. Dept. Agr. Bul. 142 (1914), pp. 59, pls. 13, fig. 1*).—This bulletin deals with the distribution, crop adaptations, cultivation, and fertility requirements of a series of soils of glacial origin which occur most extensively in western Ohio, central and northeastern Indiana, southern Michigan, the Traverse Bay region of Michigan, extreme north-eastern Illinois, eastern Wisconsin, and a portion of the upper peninsula of Michigan. These soils are distinguished by prevailing brown, light brown, or gray surface soils and yellowish-brown or darker brown subsoils.

"By far the greater part of the area occupied by the important types of the series is gently undulating to moderately rolling. The natural drainage over a large part of the territory is fair to good. . . . The Miami fine sandy loam, loam, silt loam, and clay loam comprise by far the greatest area of the soils of this series, and they are well suited with respect to topography, drainage and moisture conditions, and climatic surroundings to the growing of the most important staple crops of the temperate region. The more gravelly and sandy soils of the series are relatively unimportant agriculturally. . . . While crop yields are, in general, satisfactory, it has been found that careful attention to crop rotation, the incorporation of organic manures, the use of commercial fertilizers with the small grain crops, liming, and tile underdrainage on the heavier types aid in increasing crop yields."

Soil survey of Jeff Davis County, Georgia, P. O. WOOD ET AL. (*U. S. Dept. Agr., Advance Sheets Field Operations Bur. Soils, 1913, pp. 34, fig. 1, map 1*).—This survey, made in cooperation with the Georgia State College of Agriculture, was issued November 21, 1914. It deals with an area of 208,000 acres in south-eastern Georgia, the topography of which varies from flat to rolling. The county is drained by the Ocmulgee and Altamaha rivers and by numerous creeks which eventually flow into the Satilla River. Many fields and some entire farms are said to be greatly in need of drainage.

In general the soils of the county consist of sands of varying texture underlain usually at comparatively shallow depths by sandy clays. Twenty-two soil types of twelve series are mapped, of which the Norfolk and Tifton are the most important both in extent and agricultural value. Crop rotation is practiced only in a limited way but the appreciation of its importance and of the need of humus in the soil and of adequate drainage is growing. The use of commercial fertilizers is universal and it is stated that most of the soils need lime.

Soil survey of Bremer County, Iowa, M. BALWIN, E. B. WATSON, and F. B. HOWE (*U. S. Dept. Agr., Advance Sheets Field Operations Bur. Soils, 1913, pp. 37, fig. 1, map 1*).—This survey, made in cooperation with the Iowa Agricultural Experiment Station, was issued November 21, 1914. It deals with an area of 277,760 acres in northeastern Iowa, the topography of which as a whole is gently undulating to rolling. The regional drainage is good.

The soils of the county fall into four general classes, namely, those composed of glacial drift of the Iowa glaciation, the reworked soils originating from the glacial drift, the residual limestone soils, and the silty and sandy soils. Twenty-one soil types of eleven series are mapped, of which the Carrington loam is the most important and covers 62.3 per cent of the total area. No systematic rotation of crops as a rule is followed in the county and commercial fertilizers are said to be unimportant in the agricultural practice. The importance of careful conservation and application of organic manures is, however, being more and more recognized.

The influence of glaciation on agriculture in Ohio, E. W. OWEN (*Bul. Sci. Labs. Denison Univ., 17 (1914), Art. 11-14, pp. 390-394, fig. 1*).—An investiga-

tion to determine the effect of glaciation on agriculture in certain typical districts along the glacial boundary in Ohio showed that "while the ice sheet did not materially affect the fertility of the soil . . . it was of great economic importance in making more of the land available for profitable cultivation."

Studies on the change of the soil surface, R. HOFFMANN (*Landw. Vers. Stat.*, 85 (1914), No. 1-2, pp. 123-137).—Studies on the effects of freezing and fertilization on the total surface area of different soils, as determined by the Rodewald and Mitscherlich hygroscopicity method, are reported.

No variation in the surface area of six different surface soils due to freezing could be detected, and it is concluded that, as the effect of each successive freezing on surface soil steadily decreases, the actual effect of frost on the soil surface approaches a maximum value in approximately an asymptotic manner. It was further found that the quantities of organic and inorganic fertilizers which are used in practice effect no important or lasting change in soil surface. Apparently the mass of irreversible colloids of surface soils is so reduced by freezing and drying that the hygroscopicity values of the remaining irreversible colloids are fully covered by the hygroscopicity values of the other soil constituents.

The action of hydroxyl ions on clay and clay soils, P. ROHLAND (*Landw. Vers. Stat.*, 85 (1914), No. 1-2, pp. 105-108).—The author defends his views set forth in a previous note (*E. S. R.*, 30, p. 23) as attacked by Maschhaupt (*E. S. R.*, 31, p. 216) and maintains that the flocculation of colloids in clay soils is caused by the hydroxyl ions of calcium and other hydroxids. See also a related note by Wiegner (*E. S. R.*, 31, p. 618).

The colloids of clay and humus soils, P. ROHLAND (*Naturw. Ztschr. Forst u. Landw.*, 12 (1914), No. 8, pp. 380-385).—In a further discussion of the subject (*E. S. R.*, 30, p. 718; 31, p. 514) the author points out that in the colorimetric method for determining colloids a relation exists between absorption and the composition and reaction of the coloring matter used. He reviews experiments with different soils which indicate that the absorptive power of soil colloids for water steadily decreases after repeated drying. He also discusses the importance of colloidal content in determining plasticity and similar properties of soils.

The adsorptive power of soil colloids, P. ROHLAND (*Monatsh. Landw.*, 7 (1914), No. 7, pp. 159-165).—The author discusses the properties of soil colloids along the same lines as in the above and previous articles.

The colloidal properties of red soils, P. ROHLAND (*Kolloid Ztschr.*, 15 (1914), No. 2, pp. 96-98).—The author reviews investigations by himself and others which in his opinion prove that the characteristic properties of red soils are due to silicates of a strongly colloidal nature and that these colloidal properties are very important agriculturally.

Colloidal properties of the acid soils of Japan, T. TADOKORO (*Jour. Col. Agr. Tohoku Imp. Univ.*, 6 (1914), No. 2, pp. 27-50, pls. 3).—Studies of the colloidal properties of certain of the acid soils of Japan, with particular reference to swelling on contact with water or salt solutions, the development of heat accompanying swelling, hygroscopicity, physical adsorption, and absorption of ammonia are reported.

The degree of swelling of a soil was found to vary with the type of reagent used, indicating the formation of different gel forms with different reagents, and that the gel forming materials, particularly in acid soils poor in humus, do not represent individual substances. The small difference in increased volume found between the original humus-poor soil and the residue extracted with water was taken to indicate that colloidal substances extracted from such soils with pure water have no important connection with the swelling of the soil.

The development of heat accompanying swelling in soils is said to be probably proportional to the degree of swelling. The hygroscopicity of the soils examined averaged 5.62 and bore an almost constant relation to the degree of swelling. The adsorptive power of the soils for coloring matter decreased with its concentration and bore a close relation to the degree of swelling and hygroscopicity. The absorptive power for ammonia bore no close relation to the adsorptive power for coloring matter, degree of swelling, and hygroscopicity, and was not governed by the surface area of the colloids as much as was the adsorptive power for coloring matter. The constant for the absorption equivalent was found to be greater in acid soils poor in humus than in acid soils rich in humus and varied with different concentrations of the ammonia solution.

The absorption coefficient of the soils for ammonia in normal ammonium phosphate solution was greater than for normal ammonium chlorid solution. It is thought possible that the phosphoric acid of ammonium phosphate combines directly with aluminum, forming an insoluble compound which increases the absorptive power of the soil for ammonia.

Preliminary note on iron in Florida soils, C. A. BRAUTLECHT and A. B. PARLIN (*Jour. Indus. and Engin. Chem.*, 6 (1914), No. 11, p. 960).—In 73 samples of Florida soils examined the iron, calculated as Fe_2O_3 , ranged from 0.23 to 11.53 per cent. In general there appeared to be a direct correlation between the humus and iron. A certain correlation between the character of vegetation and the iron content was also indicated.

The absorption of certain radicals by leaves in varying stages of decay, and the effect of leaves on the absorption of these radicals by a soil, H. A. NOYES (*Jour. Indus. and Engin. Chem.*, 6 (1914), No. 7, pp. 574–576; *abs. in Chem. Abs.*, 8 (1914), No. 17, pp. 3090, 3091).—Laboratory experiments are reported which lead to the general conclusion that humus-forming substances, such as leaves, play a part in soil absorption dependent upon their state of decay.

A note on leaf-fall as a cause of soil deterioration, W. L. BALLS (*Proc. Cambridge Phil. Soc.*, 17 (1914), No. 6, p. 466; *abs. in Chem. Abs.*, 8 (1914), No. 17, p. 3090).—It was observed that the soil of certain cotton breeding plats in which the leaves from the cotton had been incorporated became unproductive. It is suggested that this may have been due to sodium chlorid which occurred in small amounts in the soil or to toxic compounds resulting from the decomposition of the leaves. The latter explanation was supported by the fact that cotton leaf mold was found very unsatisfactory for potting purposes.

Crop residues, B. SCHULZE (*Deut. Landw. Presse*, 41 (1914), No. 14, pp. 171, 172; *abs. in Jour. Bd. Agr. [London]*, 21 (1914), No. 4, pp. 333, 334).—It is pointed out that previous investigations on the value of the residue left by crops have given unreliable results, mainly because the amount of roots was not accurately determined. The author has formulated from numerous observations a ratio between the weight of the above-ground parts of plants and their root systems at the time of maturity by means of which it is easy to calculate the root residue from the weight of air-dried above-ground portions of the plant.

Applying this method to the various crops, he reaches the general conclusion that the value of plant residue, especially as regards nitrogen, is not so high as is generally supposed. His averages for the nitrogen content in pounds per acre are for various crops as follows: Winter rye, 14.2; winter wheat, 14.4; oats, 15.4; barley, 9.6; beans, 56.2; red clover (14 days after the second cutting), 41; red clover (after unhindered growth to the middle of November of the second year), 157.8; Victoria peas, 15.5; yellow lupines, 26.7; and white lupines, 20.8.

The origin of vanillin in soils—vanillin in wheat and in the water in which wheat seedlings have grown, M. X. SULLIVAN (*Jour. Indus. and Engin. Chem.*, 6 (1914), No. 11, pp. 919-921).—The occurrence of vanillin or of a mother substance of vanillin, such as coniferin, is reported in considerable amounts in wheat and in the water in which wheat seedlings had been grown. It was also found in rotten oak wood, pineapple pulp and parings, and in the hot water extract of lawn grass. It was more abundant during the early growth of the wheat plant than in the ungerminated seed.

The general conclusion is that the vanillin in soils has its origin in vegetable debris and to a less extent in direct excretion of cell sloughing by growing plants.

Antagonism between anions as affecting soil bacteria.—II, Nitrification, C. B. LIPMAN and P. S. BURGESS (*Centbl. Bakt. [etc.]*, 2. Abt., 41 (1914), No. 11-17, pp. 430-444; figs. 6; abs. in *Jour. Chem. Soc. [London]*, 106 (1914), No. 623, I, p. 1114).—In continuation of previous investigations on the effects of alkali salts on bacteria in soils (E. S. R., 28, p. 719), the authors conducted nitrification investigations from which they draw the following conclusions:

"Marked antagonism exists between the anions of Na_2CO_3 , Na_2SO_4 , and NaCl when a soil's nitrifying power is the criterion. Such antagonism is obtained when the salts are employed in both toxic, one toxic and one stimulating, and both stimulating concentrations. Even in cases of combinations of salts in which both are toxic not only normal nitrification but stimulated nitrification may be induced.

"The following are the combinations of salts which have given the most marked antagonisms, often being accompanied by marked stimulation: (a) When 0.2 per cent NaCl is the toxic salt an addition of 0.05 per cent Na_2SO_4 or an addition of 0.025 per cent Na_2CO_3 , (b) when 0.35 per cent Na_2SO_4 is the toxic salt an addition of 0.15 per cent NaCl or an addition of 0.025 per cent Na_2CO_3 , and (c) when 0.05 per cent Na_2CO_3 is the toxic salt an addition of 0.4 per cent Na_2SO_4 or an addition of 0.2 per cent NaCl . While these are the combinations producing the largest amounts of nitrates, very large amounts of the latter are often produced by much larger additions of the second salt to the toxic salt used as a constant.

"These results when correlated with similar results on ammonification and nitrogen fixation obtained by us and also with those obtained on the higher plants, along similar lines, give definite indications for the combination of alkali salts as a measure in alkali land reclamation."

Recent inoculation experiments on virgin upland moor soil with various cultures of legume bacteria, H. VON FEILITZEN and E. NYSTRÖM (*Jour. Landw.*, 62 (1914), No. 3, pp. 285-292, pls. 5).—The relative effectiveness of various commercial cultures was tested in the experiments reported.

Studies on soil protozoa.—II, Some of the activities of protozoa, A. CUNNINGHAM (*Centbl. Bakt. [etc.]*, 2. Abt., 42 (1914), No. 1-4, pp. 8-27).—Continuing previous work (E. S. R., 31, p. 26) the author reports studies of (1) the dilution method and its application in the enumeration of protozoa in soils, (2) the effect of protozoa on the numbers of bacteria in ammonifying solutions and on ammonification in solution tests, and (3) the effect of inoculations of protozoa on the bacterial content of partially sterilized soils.

It was found that the dilution method when applied to the enumeration of protozoa in soils gave rather irregular results which are only relative. It was also found that heating to 58°C . killed a considerable number of the encysted protozoa, and it is thought to be impossible to fix upon a temperature which will destroy all active protozoa in soils and leave the cysts perfectly uninjured.

Experiments on the effects of temperature and moisture on the soil protozoa showed "that some, at least, of the protozoa in soils lead an active life and are capable of multiplying to quite a considerable extent when the conditions become favorable."

It was found that soil protozoa in solution exercised a very decided limiting effect on the numbers of bacteria. The results on ammonification in solution tests did not, however, justify definite conclusions, although it is thought that the flagellates may have a depressing influence on ammonification.

Reduction in bacterial numbers in the soils inoculated with protozoa was found to be very marked and to lie well outside the limits of experimental error. "The conclusion may safely be drawn, therefore, that the limiting factor or at least one limiting factor (of Russell and Hutchinson) has been inoculated into the sterilized soils and has produced its effects on the numbers of bacteria."

A preliminary communication on three new proteomyxan rhizopods from soil, T. GOODEY (*Arch. Protistenk.*, 35 (1914), No. 1, pp. 80-102, pls. 4).—The following organisms isolated from soil by means of an agar plate method are described: *Leptomyxa reticulata* n. g. and n. sp., *L. flabellata* n. g. and n. sp., and *Gephyramæba delicatula* n. g. and n. sp.

The methods used are described, and a bibliography of literature bearing on the subject is given.

Sterilization or disinfection of the soil, MÈGE (*Bul. Soc. Nat. Agr. France*, 74 (1914), No. 4, pp. 428-432).—This note, reviewing briefly previous experiments by others in soil sterilization, gives a condensed account of the author's work carried out at Rennes during 1912 and 1913 with barley and white mustard planted in soil treated with different strengths of various disinfectants in solutions or in gaseous form.

While in case of some treatments, as with baryta and creosote, the results were unfavorable, it is claimed that in several others large increases of yield were obtained as the result of the soil treatment, notably by the use of toluene or formaldehyde.

Suggestions for judging the agricultural value and adaptation of land, W. P. BROOKS (*Massachusetts Sta. Circ.* 44 (1914), pp. 8).—This is a brief statement regarding the possibility of estimating the productive capacity and adaptation of land by examination on the spot. The most important factors to be observed are (1) the depth and color of the surface soil, (2) the level of the water table and the conditions affecting drainage, (3) the soil texture, (4) the general appearance and texture of the subsoil, and (5) the character of natural and spontaneous vegetation.

The chemical analysis of soils, W. P. BROOKS (*Massachusetts Sta. Circ.* 45 (1914), pp. 4).—This is a revision of Circular 29 (E. S. R., 24, p. 713).

The crop experiment and soil analysis, O. LEMMERMANN (*Landw. Vers. Stat.*, 85 (1914), No. 1-2, pp. 147-154).—The author agrees with Mitscherlich (E. S. R., 31, p. 217) that in fertilizer experiments all the environmental factors, particularly the physical properties of the soils used, exert an influence on the crop yield and must, therefore, be kept constant in order to determine the effect of varying the amounts of a particular nutritive element. In determining the plant food content of soils and the relative solubilities of the nutritive elements he is of the opinion that the best method is to allow the solvent used to filter through the soil sample at a fixed rate of speed.

Investigations at the Jasper County experiment field, M. F. MILLER and R. R. HUDELSON (*Missouri Sta. Bul.* 119 (1914), pp. 30, figs. 7).—This bulletin gives the results of field experiments with a four-year rotation of corn, cow-

peas (as green manure), wheat, and clover carried on since 1909 to determine the fertilizer needs of the typical dark brownish-gray silt loam prairie soil of a region formed largely from limestone and shale. Chemical analysis showed the soil to be deficient in nitrogen and humus and somewhat acid in the surface layers, the acidity representing a lime requirement equivalent to about 2,400 lbs. of ground limestone per acre to a depth of 7 in.

The soil treatments tested consisted of (1) cowpeas; (2) cowpeas and limestone; (3) cowpeas, limestone, and bone meal; (4) cowpeas, limestone, bone meal, and muriate of potash; (5) no treatment; (6) manure; (7) manure and rock phosphate; (8) manure, rock phosphate, and limestone. The limestone was used once during the rotation at the rate of 2 tons per acre, bone meal, 150 lbs. per acre, and muriate of potash, 50 lbs. per acre, before the corn and wheat, and rock phosphate, 800 lbs. per acre, and barnyard manure, 8 tons per acre, once in the rotation before corn.

The best average yields of corn were obtained with treatments 7 and 8, the highest average net return with treatment 6. The highest average yield of cowpea hay and the highest net return were with treatment 7. The highest average yield of clover and the highest net return were with treatment 7. The highest yield of wheat and the highest average profit were with treatment 4 followed closely by treatments 6 and 7.

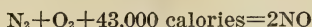
Recommendations are made regarding the handling of this soil, including methods of maintaining the supply of organic matter and the use of phosphates, potash, and lime. It is noted that manure has a high value on this soil and its conservation and use is urged. The practice of sowing cowpeas in the corn at the last cultivation was not usually profitable. It was apparently better to plant in the rows. It is believed that after the content of organic matter in the soil has been made more nearly normal it may be profitable to apply finely ground rock phosphate in amounts of 1,000 lbs. once in four to six years in connection with manure or green manure. "For corn, where an immediate return is required, it can best be secured by using about 100 lbs. per acre of a mixed fertilizer relatively high in phosphorus, but containing some potash and perhaps a little nitrogen," but it is pointed out that this practice will not build up the soil. With the present condition of the soil a fertilizer containing 1 to 2 per cent ammonia, 10 per cent available phosphoric acid, and 4 to 5 per cent water-soluble potash is recommended for corn at the rate of 200 lbs. per acre and for wheat at the rate of 150 to 175 lbs. per acre.

To what extent do stable manure and green manure affect yields through the carbon dioxid they produce? BORNEMANN (*Mitt. Deut. Landw. Gesell.*, 28 (1913), No. 31, pp. 443-445; *abs. in Centbl. Bakt. [etc.]*, 2. Abt., 41 (1914), No. 9-10, pp. 290, 291).—In experiments with spinach on a plat of soil constantly supplied with carbon dioxid through a buried pipe there was an increase in yield of 12.2 per cent over the crop grown on untreated soil. The possibility of increasing the carbon dioxid supply of soil and thus increasing the yield by means of organic manures is discussed and the need of exact experiments on this subject is pointed out.

Poultry manures, their treatment and use, W. P. BROOKS (*Massachusetts Sta. Circ.* 36 (1914), pp. 4).—A revision of Circular 22 (E. S. R., 23, p. 717).

The oxidation of nitrogen and how cheap nitrates would revolutionize our economic life, W. W. STRONG (*Science*, n. ser., 40 (1914), No. 1042, pp. 899-903; *Amer. Jour. Pharm.*, 87 (1915), No. 1, pp. 29-34).—The nature of the chemical reactions involved in the oxidation of nitrogen and the inefficiency of the processes used are discussed.

It is stated that "we can get some idea of the inefficiency of the present methods of oxidizing nitrogen when we consider that when gram molecular weights of the gases are used one has:



approximately. The amount of energy used in this reaction is therefore about $1.7 (10)^{12}$ ergs for about 126 gm. of nitric acid. Assuming 80 gm. of nitric acid to be made per kilowatt hour, we should have an energy consumption of about $5 (10)^{13}$ ergs or an efficiency of about 4 per cent.

"The small percentage efficiency of the present methods for oxidation compared with theoretical efficiency indicate that improvements in the present methods would yield most important results. . . . Probably no other one scientific development would so materially add to the material well being of the people as this."

Nitrogenous fertilizers in agriculture with special reference to the new nitrogenous fertilizers, P. KULSCH (*Jour. Gasbeleucht.*, 57 (1914), Nos. 7, pp. 151-156; 8, pp. 172-176; *abs. in Chem. Ztg.*, 38 (1914), No. 108-109, *Repert.*, p. 471).—A general discussion of the relative merits and economy of sodium nitrate, ammonium sulphate, and the newer nitrogenous fertilizers. A mixture of nitrates and ammonium sulphate is recommended, and great care in the use of lime nitrogen is advised.

Top-dressing with Chile nitrate, A. F. KIEHL (*Bl. Zuckerrübenbau*, 21 (1914), No. 12, pp. 182-184; *abs. in Chem. Ztg.*, 38 (1914), No. 92, *Repert.*, p. 427).—The author holds that any injury which may result from applying sodium nitrate as a top-dressing as compared with row application in case of beets is due only to the presence of poisonous constituents, such as iodates.

The Elliston phosphate field, Montana, R. W. STONE and C. A. BONINE (*U. S. Geol. Survey Bul.* 580-N (1914), pp. II+373-383, *pl. 1*).—A detailed study of the geology and of the extent and character of the phosphates of this field is reported. It is estimated that the field contains a total of more than 86,000,000 tons of 65 per cent phosphate, a considerable part of which is easily accessible to railway transportation.

The Bernard phosphate as compared with superphosphate and slag, E. JELMONI (*Rivista [Conegliano]*, 5. ser., 20 (1914), No. 22, pp. 509-512).—The comparative plat tests reported in this article indicated the pronounced superiority of the superphosphate but showed little difference in effect between Bernard phosphate and Thomas slag.

The manufacture of acid phosphate, W. H. WAGGAMAN (*U. S. Dept. Agr. Bul.* 144 (1914), pp. 28, *pls. 5*).—This bulletin deals mainly with a description and explanation of the chemistry of the process of making acid phosphate. Incidentally it deals briefly with raw materials used, the theoretical basis for the manufacture of acid phosphates, impurities in rock phosphate in relation to the manufacture of acid phosphate, reversion of superphosphates, cost of production, and disposal of the product.

It contains information of value to fertilizer manufacturers, "but it is intended primarily to give the progressive farmer a clearer knowledge of that compound which is the basis of fertilizers, in order that he may more intelligently buy and handle his fertilizer and determine for himself its true value."

Deposits of potash salts and other minerals used as fertilizers (*Bol. Agr. Téc. y Econ.*, 6 (1914), No. 68, pp. 739-743).—This article gives the text of the royal decree and of a proposed law providing for government reservation, exploitation, and control of supposed potash-bearing lands in northern Spain.

The agricultural utilization of potassic rocks, F. MARRE (*Rev. Gén. Chim.*, 17 (1914), No. 12, pp. 193-195).—Various processes for preparing potash salts from potassic rocks are described.

Feldspar as a possible source of American potash, A. S. CUSHMAN and G. W. COGGESHALL (*Amer. Fert.*, 41 (1914), No. 12, pp. 22-29; *Chem. Engin.*, 21 (1915), No. 1, pp. 4-11; *Jour. Indus. and Engin. Chem.*, 7 (1915), No. 2, pp. 145-151).—The subject is discussed on the basis of definite data as to details of the process of obtaining potash from feldspar and of cost of the final product. A general conclusion is that the plants necessary to supply the present American consumption of potash from this source could be constructed for not more than \$6,000,000, and that the potash could be produced at a profit at the 1914 syndicate prices.

Can soda completely or partly replace potash in the nutrition of sugar beets? W. KRÜGER ET AL. (*Ztschr. Ver. Deut. Zuckerindus.*, No. 703, II (1914), pp. 694-705; *abs. in Chem. Ztg.*, 38 (1914), No. 108-109, *Repert.*, p. 471).—The results of pot experiments are reported to show that soda can neither completely nor partly replace potash in the nutrition of beets, but acts indirectly in promoting the assimilation of the potash of the soil. The soda is considered to exert no direct physiological effect.

Is the doctrine of the lime factor an hypothesis or a proved theory? O. LOEW (*Landw. Jahrb.*, 46 (1914), No. 5, pp. 733-752, *fig. 1*; *abs. in Chem. Abs.*, 8 (1914), No. 22, p. 3701).—Evidence is cited to show that the doctrine of the lime factor has been established as a proved theory by the work of various investigators with water, sand, and soil cultures, and that only a part of the explanations are to be regarded as hypotheses. Results which do not bear out the theory are described as due to changes in the soil by liming, to inaccurate pot experiments, or to a lack of observation of the law of minimum.

It is urged that in soil analyses the determination of magnesia should not be neglected.

The source, manufacture, and use of lime, E. F. BURCHARD and W. E. EMLEY (*U. S. Geol. Survey, Mineral Resources of the United States Calendar Year 1913*, pt. 2, pp. V+1509-1593, *pls. 2, figs. 4*).—This is a detailed report of investigations begun in 1909 in cooperation with the National Lime Manufacturers' Association. The paper is designed to furnish the essential data needed by the prospective lime manufacturer, as well as by the active manufacturer who desires a combined summary of the raw materials and of the recent developments in the lime industry. It contains a short section on agricultural lime.

Common salt and its use as manure in the Konkan Division, V. H. GONHALLI (*Dept. Agr. Bombay Bul.* 59 (1914), pp. 19).—The general use of salt as a fertilizer for mangoes, coconuts, rice, and other crops in this region is discussed, a common rotation with coconut and mango trees being cattle manure the first year, fish manure the second, and salt (10 lbs. per tree) the third year.

Some modification of government regulations regarding the salt tax whereby this material may be obtained for such fertilizing purposes is urged.

The use of radio-active substances as fertilizers, W. H. ROSS (*U. S. Dept. Agr. Bul.* 149 (1914), pp. 14).—From a review of investigations by others the author concludes that "it seems incredible that radium or any of its products can have any economical application as a fertilizer in general farming; and still less credible that the so-called radio-active manure has any value, as far as its radio-activity is concerned, since the radium already present, on an average, in an acre-foot of soil, is about 100 times greater than is contained in the quantity of radio-active manure commonly recommended for application to an acre.

"Many experiments have been made in studying the influence of the radio-elements, when freed from their ores, on the germination of seeds and the growth of plants, and from the results obtained it is to be expected that in botanical research, and possibly in greenhouse practice, where the results obtained may justify the expense involved, the radio-elements may prove of considerable value; but when consideration is taken of the scarcity of these elements it does not follow from any experiments yet described that such elements can have any practical application as a fertilizer in general farming.

"Evidence is given to show that the action of uranium on plants is due to its chemical properties rather than to its property of being radio-active, and that the conflicting results obtained with radio-active manure from different sources is to be explained largely by the presence of uranium, and of such nonradio-active constituents as soluble salts and free acids."

The fertilizing value of shoddy (*Mark Lane Express*, 112 (1914), No. 4339, p. 584).—Brief reference is made to experiments carried out at Wye Agricultural College, England, which indicated that shoddy is a useful and reliable source of nitrogen especially when used in conjunction with, or as a substitute for, barnyard manure and supplemented with applications of phosphate and potash.

In experiments with potatoes comparing combinations of barnyard manure, phosphates, and potash with seaweed, fish guano, and shoddy the last named combination gave decidedly the largest yield.

Commercial fertilizers and agricultural lime, 1913 (*Agr. Com. Ohio, Off. Rpt. Com. Ferts.*, 1913, pp. 253).—Analyses and valuations of fertilizers licensed for sale in Ohio during the year are reported, with general comments on the results and a series of special popular articles relating to fertilizers as follows: The Home Mixing of Fertilizers, Soil Analysis not a Sufficient Guide to the Use of Fertilizers, Comparison of Carriers of Phosphorus in Fertilizers, Important Questions and Answers Relative to the Use of Manures and Fertilizers, The Nitrogen of the Fertilizer Sack, What is Lime? Raw Phosphate Rock as a Fertilizer, and Field Experiments with Fertilizers, by C. E. Thorne; Twelve Important Facts a Farmer Should Know When Purchasing Fertilizers, by H. G. Bell; The Phosphoric Acid in Phosphate Slag, Use of Fertilizers, and Analysis of Commercial Fertilizers, by N. W. Lord; The Manufacture and the Marketing of Fertilizers, by J. T. Welch; Fertilizing Problems, by A. Vivian; Bone Fertilizers, Potash, Filler or Make-Weight Materials, and Ammonia or Nitrogen, by E. E. Somermeier; and Orchard Fertilization Work by the Ohio Experiment Station in Southeastern Ohio, by F. H. Ballou.

Report of analyses of samples of commercial fertilizers (*New York State Sta. Bul.* 390 (1914), pp. 491-574).—Analyses of samples of fertilizers collected during 1914 are reported.

Tabulated analyses of commercial fertilizers, W. FREAR (*Penn. Dept. Agr. Bul.* 255 (1914), pp. 93).—This bulletin gives the results of fertilizer inspection, including analysis and valuations, in Pennsylvania from January 1 to August 1, 1914.

AGRICULTURAL BOTANY.

Size inheritance and the pure line theory, W. E. CASTLE (*Ztschr. Induktive Abstam. u. Vererbungslehre*, 12 (1914), No. 3-4, pp. 225-237).—The author gives a discussion of size inheritance in its Mendelian aspect and also of the pure line theory.

In regard to the first, he summarizes his own observations and those of others as follows: "When animals or plants are crossed which have racial

differences in size or other characters, in respect to which each race shows continuous variation about a different mean, the F_1 progeny are of intermediate size. They may or may not be more variable than the races crossed, but quite commonly are not. The F_2 generation as a whole commonly varies about the same intermediate mean as the F_1 generation, but its variability as measured by the standard deviation or the coefficient of variation is usually greater than that of the F_1 generation."

In regard to the pure line theory, the author points out the importance of knowing whether or not this theory is true and claims there is a lack of demonstrative or even probable evidence in its favor. He believes it is desirable to devise ways of putting this theory to an experimental test.

A bibliography is appended.

Breeding experiments which show that hybridization and mutation are independent phenomena, R. R. GATES (*Ztschr. Induktive Abstam. u. Vererbungslehre*, 11 (1914), No. 4, pp. 209-279, pl. 1, figs. 25).—Presenting and discussing a large body of cytological and breeding data obtained in work with *Oenothera*, including crosses between forms differing in so many characters that they are regarded as equivalent to interspecific crosses, the author claims to have shown that the mutations which also appear in these crosses are not the result of recombination or blending of characters in the hybrids, but that they have a different cause, being independent of all laws of hybrid combination and hybrid splitting. Even in forms that have been crossbred, some of the mutations at least owe their origin to a cause which is independent of the mere mingling of characters in hybrids. Mutation in *Oenothera* is deemed a unique process, no amount of hybrid combination or splitting, Mendelian or otherwise, being sufficient to account therefor.

A bibliography is appended.

Genetical studies on *Oenothera*, V. B. M. DAVIS (*Ztschr. Induktive Abstam. u. Vererbungslehre*, 12 (1914), No. 3-4, pp. 169-205, figs. 22).—Descriptions and illustrations are given of the results of reciprocal crossings among species of *Oenothera*. The author states that the terms *patroclinous* and *matroclinous* are here used in a relative sense, indicating strong resemblance but not perfect duplication of the characters concerned, he having observed no certain instance of the transmission of a morphological character of either species in a cross to the F_1 hybrids without more or less alteration.

The character of anthocyanin coloration exhibited wide fluctuations, frequently making it difficult to judge whether an absolute character or a blend was under consideration. *Patrocliny* and *matrocliny* are, however, regarded as very striking phenomena, demanding an explanation which is not yet evident.

The author concludes that there seems to be left to us only the vague conception of *prepotency*, which is really no explanation, although it serves at least to name the phenomenon. There is in these hybrids a strong *prepotency* of the male parent over the female, although this does not affect all of the characters. An important feature of this *prepotency* lies in the fact that it is not a peculiarity of certain individuals of the same sex, but that it is a *prepotency* of one species over another with respect to the characters concerned.

Results obtained by crossing a wild pea from Palestine with commercial types, A. W. SUTTON (*Jour. Linn. Soc. [London], Bot.*, 42 (1914), No. 286, pp. 427-434, pls. 3, fig. 1).—In continuation of a previous note (*E. S. R.*, 30, p. 330), the author gives some results obtained by crossing a wild pea collected by himself in Palestine with a variety of *Pisum sativum*. Some of these hybrids have been carried through the fourth generation, and several new types are described.

The object of the investigation was to determine whether this wild pea might be the original from which were derived the present garden and field peas. In the previous account some doubt was expressed regarding this, as many of the hybrids proved to be sterile. In the latter investigations some of them were fertile, but the main purpose of the investigation does not seem to have been attained.

Six different species of nodule bacteria, H. GARMAN and MARY DIDLAKE (*Kentucky Sta. Bul.* 184 (1914), pp. 341-363, pls. 7).—As a result of several years' experiments in which plants were grown under sterile conditions in agar, water cultures, and soil cultures, the authors arrived at the conclusion that there are several strains of nodule bacteria, some of which are rather closely limited as to their ability to infect different species. Their investigations indicate that there are varietal or racial forms occurring on alfalfa which also inoculate other species of *Medicago*, a form on clover which is confined to plants of the genus *Trifolium*, one occurring on vetch and garden peas, one on the cowpea, one on the soy bean, and one on the garden bean. Detailed accounts are given of all of the inoculation experiments carried on.

The nitrogen nutrition of mold fungi, W. BRENNER (*Centbl. Bakt. [etc.]*, 2. Abt., 40 (1914), No. 22-25, pp. 555-647, pl. 1, fig. 1).—Reporting results of a continuation of former studies (*E. S. R.*, 27, p. 26), chiefly with *Aspergillus niger* as nutritively related to various nitrogen compounds, the author states that concentration of nitrogen in the nutritive medium and also age of the culture involved exercised a decided influence on the growth of the fungus tested. Diminution of the nitrogen supply resulted quickly in increased proteolysis and a decrease in the nitrogen content of the fungus produced under such circumstances. But little light was thrown upon the question as to the form in which the nitrogen was utilized in these experiments.

An extensive bibliography is appended.

Bacterial symbiosis in case of Rubiaceæ, F. C. VON FABER (*Jahrb. Wiss. Bot. [Pringsheim]*, 54 (1914), No. 2, pp. 243-264, figs. 3).—In continuance of earlier communications (*E. S. R.*, 27, p. 225; 28, pp. 35, 130), the author, discussing also related contributions by Miehe (*E. S. R.*, 29, p. 30) and others, reports further studies tending in some respects to confirm the claim that hereditary symbiosis exists between certain plants, as *Pavetta* spp., and their in-dwelling organisms.

The assimilation of atmospheric nitrogen by plant hairs, F. KÖVESSI (*Rev. Gén. Bot.*, 26 (1914), Nos. 301, pp. 22-47; 303, pp. 106-128, pl. 1, figs. 2).—Continuing previous communications (*E. S. R.*, 25, p. 326), and giving more particular attention to the claims made by Jamieson (*E. S. R.*, 19, p. 127) and by Zemplén and Roth (*E. S. R.*, 22, p. 521), the author describes experiments with *Robinia pseudacacia*, *R. hispida*, *Ribes grossularia*, *Aesculus hippocastanum*, *Acer platanoides*, and *A. pseudoplatanus*. He stated that the trichomes of plants cultivated in free air and those of plants in a nitrogen-free medium developed in exactly the same way, and maintains that nitrogen is not taken up by the trichomes from the air directly.

The biological formation and function of alkaloids, J. GADAMER (*Ber. Deut. Pharm. Gesell.*, 24 (1914), pp. 35-55; abs. in *Jour. Chem. Soc. [London]*, 106 (1914), No. 618, I, p. 467).—Reviewing critically the various theories advanced regarding the formation and function of alkaloids in plants, the author claims that while the theory that alkaloids are formed from decomposition products of proteins (and that they are therefore waste products) explains many of the facts known, it is not in harmony with observations made by the author that *Papaver orientale* contains thebaine only when at the height of vegetative

activity, and isothebaine only when in a resting state. It is held that in this case the alkaloid may have some definite biological function.

Formation of carbohydrates in plants, H. FINCKE (*Ztschr. Untersuch. Nahr. u. Genussmtl.*, 27 (1914), No. 1-3, pp. 8-21; *abs. in Jour. Chem. Soc. [London]*, 106 (1914), No. 618, I, p. 466).—Discussing the views of several investigators, the author concludes that no intermediate products but only the end results of carbon dioxid assimilation are really known at present; that in the process of assimilation, reduction of carbon dioxid is probably accompanied by the formation of a chain containing two carbon atoms; and that glycolaldehyde is probably the chief intermediate product rather than formaldehyde, sugars and other vegetable products being formed therefrom.

The synthesis of sugar by radium emanations, J. STOKLASA, J. SEBOR and V. ZDOBNICKY (*Compt. Rend. Acad. Sci. [Paris]*, 156 (1913), No. 8, pp. 646-648).—This is a continuation of work previously noted (E. S. R., 25, p. 125) and deals with the synthesis of sugars from carbon dioxid and nascent hydrogen in the presence of potassium carbonate. Formaldehyde (polymerized) in the presence of potassium carbonate results in the formation of reducing sugars. A hexose and pentoses were positively noted. Ketoses were looked for but not found. One hundred parts of organic substance was found to contain 51.05 parts of reducing substances. From the standpoint of physiology the radium rays resembled very much the ultraviolet rays.

Influence of current electricity on absorption of nutritive substances by plants, D. CHOUGHAK (*Compt. Rend. Acad. Sci. [Paris]*, 158 (1914), No. 25, pp. 1907-1910).—The author has followed up work previously done (E. S. R., 29, p. 732) by a study of the possible influence of weak electrical currents passed through living, as compared with those in dead, plantlets of wheat in nutritive solutions of known composition.

The results, which are detailed, are held to indicate that while as already shown (E. S. R., 27, p. 826), the rapidity of utilization of solutes is closely related to their concentration, another factor, the electrical conditions in the roots, may be largely influential in absorption of nutritive ions. Control of this latter factor may create new possibilities as regards the productiveness of cultivated plants.

Physiological studies on lactescence and caoutchouc, F. TOBLER (*Jahrb. Wiss. Bot. [Pringsheim]*, 54 (1914), No. 2, pp. 265-307, figs. 6).—Results of these studies as given in some detail are claimed to show close relations between the quality and quantity of sap flow in case of Manihot, Mascarenhasia, etc., and the conditions and stages of growth, as humidity, illumination, nutritive materials at hand, ages of shoots, leaves, etc. Claims of protective influence by these secretions of the plant against snails were not supported.

The controlling influence of carbon dioxid in the maturation, dormancy, and germination of seeds, II, F. KIDD (*Proc. Roy. Soc. [London]*, Ser. B, 87 (1914), No. B 599, pp. 609-625).—Reporting on a continuation of previous investigations (E. S. R., 31, p. 521), the author states that the inhibitory value of given partial pressures of carbon dioxid increases with a lowering of the temperature and oxygen supply, but decreases as these are heightened, and he points out the possible bearing of these relations upon the dormancy of moist seeds in natural conditions.

Arrested development of maturing seeds still on the plant is claimed not to be due to lack of moisture or any physiological insufficiency. Such seeds contain more carbon dioxid than do seeds at the time of normal germination. The testa retards germination in seeds tested before normal drying, as well as after drying and storing. Correlation is noted between the viviparous habit and the absence of seed coats.

Carbon dioxid is claimed to show stimulative effects at low partial pressures, these rising to a maximum with increasing pressures and then declining to inhibition with higher pressures of carbon dioxid, at least in case of *Brassica alba* and *Hordeum vulgare* germinated in the dark. Rapidly deteriorating seeds (as in case of *Hevea brasiliensis*) in the confined carbon dioxid of their own natural respiration showed a marked prolongation of vitality, this being far in excess of that shown by such seeds as ordinarily packed for shipment.

It is claimed that in general the arrested development of moist maturing or resting seeds is primarily a phase of carbon dioxid narcosis due to a partial pressure of that gas in the tissues of the embryo, and that the final germination is related to a lowering of the inhibitory partial pressure.

Observations on the development and germination of the seed in certain Polygonaceæ, E. F. Woodcock (*Amer. Jour. Bot.*, 1 (1914), No. 9, pp. 454-476, pls. 4).—The author describes the morphology of the seed of a number of species of plants belonging to the family Polygonaceæ, after which he gives an account of investigations on their germination.

It was found that the germination of *Rumex crispus*, *Fagopyrum esculentum*, *Polygonella articulata*, and *Polygonum scandens* shows that the aleurone layer has presumably a digestive function, secreting a ferment which converts the insoluble starch of the endosperm into a form available for the germinating embryo. The cells of the layer become much enlarged, and in *Rumex*, *Polygonella*, and *Polygonum* this increase in size of the aleurone layer causes the micropylar portion to appear outside the seed coats. In *Rumex* and *Fagopyrum*, the absorbed carbohydrate is temporarily reconverted into starch in the tissues of the germinating embryo, the cotyledons being the principal storage organs.

The significance of radio-activity in physiology, J. STOKLASA (*Centbl. Bakt. [etc.]*, 2. Abt., 40 (1914), No. 11-13, pp. 266-280).—This is mainly a synthetic review of the results of studies continued by the author and several collaborators during the past seven years, some of which have already been noted (E. S. R., 28, p. 731; 29, p. 130; 30, p. 524). The leading motive of these studies is to discover in what ways radio-activity is related to metabolic processes in plants with or without chlorophyll, that is, bacteria, yeasts, and higher plants (including germination, growth, and respiration of these last). The conclusions reached are presented in considerable detail.

Photosynthesis in submerged land plants, H. V. HEIMBURGER (*Proc. Ind. Acad. Sci.*, 1912, pp. 95-98).—According to the author a number of land plants are able to carry on photosynthesis when submerged in water, *Melilotus alba* and *Nepeta cataria* showing considerable evolution of gas when so submerged. A number of other species are noted as able to carry on this process under abnormal conditions, but with less evolution of gas than in the species above mentioned.

FIELD CROPS.

A biological and statistical analysis of the vegetation of a typical wild hay meadow, A. B. STOUT (*Trans. Wis. Acad. Sci., Arts, and Letters*, 17 (1913), pt. 1, pp. 405-470, pls. 6).—In this article the author reviews investigations of other workers along this line, and gives the results of his study of the marsh formations of the region about the city of Madison, Wis., by analysis of the flora by statistical methods with the aim of obtaining the numerical relations and the relative importance of the various species as they are grouped in such association.

The plants other than *Eleocharis* species in every other foot of a 4-in. strip 2,300 ft. in length, were counted, and a list of species growing on this strip is

given. The total population of the transect of this marsh is given as 52,377, *Carex* species constituting 63 per cent, grasses 24 per cent, *Carex stricta* 40 per cent, and *Calamagrostis canadensis* 18 per cent. The growth habits of the plant association are described and discussed. Some space is devoted to the discussion of geographical distribution of the species and of the distribution of marsh meadows in North America.

The range of the depth of the water table of the area under observation was from a few inches to 3 ft. or more. The results of a series of pot experiments to test the influence of the ground water level and to determine whether there is a correlation between the depth of the water table and the root and shoot development are given. Alsike clover, redbtop, timothy, and bluejoint plants were grown in peat soils in which the water tables were maintained (1) at the surface of the soil, (2) 4 in., (3) 8 in., (4) 12 in., (5) 24 in., and (6) 30 in. below the surface of the soil. Each species was grown in each cylinder. The result "shows that under the conditions given the roots of all the species tested can extend below the water level and make a vigorous growth in the water saturated soil. The best general plant development was in cylinders 3 and 4 where the roots had a zone of soil 8 and 12 in. thick above the water table. In these, root development was more extensive than was the case in cylinders 5 and 6 where there was much deeper water tables. There is, however, a marked uniformity in the root development in cylinders 2, 3, 4, 5, and 6, irrespective of the wide differences in the water level.

"In cylinder 1 all the plants made a dense mat-like growth of roots in the surface 2 in. of soil below which there was relatively little root growth. While redbtop and bluejoint sent roots down into the water to a depth of 17 and 20 in. these roots did not branch much. In the other cylinders there was no marked zonal distribution of the roots although there were relatively more roots in the upper layers. . . .

"The greatest differences between the four species in any one cylinder was seen in No. 1. The bluejoint and redbtop showed a marked ability to develop with the water level at the surface but this was unfavorable for their best development.

"In cylinder 6 none of the roots extended to the water level, which was 2½ ft. below the surface, and the growth that each species here made was surpassed in at least one other cylinder. This indicates that the water level suitable for the maximum development has been passed and that no better growth can be expected with a still lower water table."

The conclusions were as follows:

"There is sharp correlation between root and shoot development. There is poor development when the water level is constantly at the surface. There is a marked development of roots in water-soaked soil when the water level stands at 4, 8, and 12 in. A high water table (not above 4 in.) is not prohibitive to the growth of these plants, but rather is favorable for the best growth."

A bibliography of 25 titles is appended.

A study of the development of the most important meadow grasses in the first vegetative year, E. SINZ (*Jour. Landw.*, 62 (1914), No. 3, pp. 197-233, pls. 4).—This describes and gives some results of work carried on at Göttingen in pot cultures with 11 common grasses. Tabulated data on the plants thus grown show the green and air-dried weights, percentage of dry substance and of nitrogen in both the tops and the roots, and the ratio of tops to roots during the first season's growth. In some cases the amounts of nitrate of soda applied as a fertilizer were varied.

It is noted that by far the strongest growth of 2-months-old plants was made by *Lolium perenne*, *L. italicum*, and *Festuca pratensis*. Two-month-old plants ranged in individual weight from 0.024 gm. (*Cynosurus cristatus*) to 0.837 (*L. italicum*) for tops, and from 0.0035 gm. (*Poa pratensis*) to 0.282 gm. (*L. italicum*) for roots. The length of roots of the various plants ranged from 0.3 cm. with *P. pratensis* to 31 cm. with *L. perenne*. The largest root quantity was shown by *L. perenne*, *L. italicum*, *F. pratensis*, *Avena elatior*, and *Dactylis glomerata*.

Three cuttings were made during this first season. It is noted that in general with the strong-rooted varieties the root growth increased with the number of cuttings, but with the weak-rooted varieties, as the Poas, the root mass was reduced when the cuttings increased.

The range of ratios of tops to roots computed from yields of three cuttings (July 26, September 14, and November 7) from a series that had been planted, on June 13, is shown to be from 1.25:1 with *F. ovina* to 4.75:1 with *Phleum pratense*. In another series planted June 26 similar ratios ran from 1.37 with *D. glomerata* to 5.23 with *P. pratense*. The observed characteristics and phenomena, including the relations of root growth to top growth as influenced by the number of cuttings, the nitrogen content as influenced by the various nitrogen applications, and the character of the root systems of the different varieties including color and physiological relations, are discussed.

The grasses are finally arranged in the following four groups according to their productive ability: "(a) *L. perenne*, *L. italicum*, *F. pratensis*, *A. elatior*; (b) *D. glomerata*, *P. pratense*, *Alopecurus*; (c) *Poa trivialis*, *Agrostis stolonifera*, *Cynosurus*; (d) *F. ovina*, *P. pratensis*." Results of germination tests of seeds of these varieties of grasses are also given and discussed to considerable length.

Accumulated fertility in grass land in consequence of phosphatic manuring. W. SOMERVILLE (*Jour. Bd. Agr. [London]*, 21 (1914), No. 6, pp. 481-492, pl. 1).—In order to study the effect of applications of phosphatic manures (notably basic slag) that have been made to grass land during the past 20 to 30 years, pots were filled with soil from the treated and untreated land in several centers in England and oats, as a first crop, was grown. This article describes this experiment and gives the results.

Data show the treated soil from four centers to have given an increase in total yield of 153, 124, 31, and 15 per cent, respectively, over the untreated soils. The amount of such improvement, it is noted, will depend on the amount of phosphate used, the time during which it has acted, and the inherent suitability of the land to respond to phosphates. "While it would appear that the accumulated fertility is partly due to phosphatic residues, it is certainly due in most part to the secondary effects of the phosphates, of which the accumulation of humus, including the fixation of atmospheric nitrogen, is probably the most important."

Study of chemical composition of grasses and clovers at different ripening stages. K. RORDAM (*K. Danske Vidensk. Selsk. Skr., Naturvidensk. og Math. Afd., 7. ser., 10* (1913), No. 4, pp. 363-426; *abs. in Zentbl. Agr. Chem., 43* (1914), No. 8, pp. 530-534).—A report is given of a study of the composition of *Lolium italicum*, *Avena elatior*, *Bromus arvensis*, *Dactylis glomerata*, *Festuca pratensis*, *Trifolium rubrum*, *Lotus corniculata*, and *Anthyllis vulneraria*, as hay harvested in early June and as threshed straw harvested in July and August. It is noted that in general both grasses and clovers gave a higher percentage of dry matter in the air-dried substance of their straw than of their hay. *Dactylis glomerata* was the only exception.

The clovers were found to contain large quantities of lime and magnesia, the grasses of silica and potash, while both classes of plants were fairly uniform in phosphoric acid. Both grasses and clovers showed a lower content of SiO_2 , CaO , MgO , K_2O , and P_2O_5 in the straw than in the hay. The ratio of $\text{MgO} : \text{CaO}$ is given as 1:32 for the grasses and as 1:7.1 for the clovers. Tabulated analyses showing the content of ash, crude fat, protein, amid substances, invert sugar, free pentosan, cutin-free pectocellulose, and cutin, are given.

Green manuring and cover crops, W. P. Brooks (*Massachusetts Sta. Circ. 37* (1914), pp. 6).—This circular attempts to indicate briefly the possible benefits from the use of green manure and cover crops, and the principal reasons therefor, and to consider the special characteristics, value, and adaptation of each of the following crops: Winter rye, buckwheat, white mustard, rape, vetches, field peas, crimson clover, red clover, sweet clover, soy beans, and cowpeas.

The conditions under which green manuring would be advisable are briefly discussed.

The work of the San Antonio experiment farm in 1913, S. H. HASTINGS (*U. S. Dept. Agr., Bur. Plant Indus., Work San Antonio Expt. Farm, 1913, pp. 1-9, 11-15, figs. 3*).—This reports continued work in rotation and tillage experiments conducted at the San Antonio, Tex., experiment farm previously noted (*E. S. R.*, 29, p. 31).

It is noted that on account of the favorable results obtained with Dwarf milo maize, it has been introduced into several rotations instead of corn. Four years' experience has shown the undesirability of growing cowpeas as a summer crop after oats or corn, on account of summer drought. Field peas (Canada) are shown to have been a highly satisfactory winter cover crop and green manure. It is mentioned that Sudan grass has been introduced into a 3-year rotation. The yields of crops in rotation are noted as being generally high for 1913 and uniformly higher than when the same kind of crops have been grown continuously on the same land. Results from subsoiling are noted as having been indifferent or negative and fallowing gave results similar to previous years.

In the experiments on the spacing of cotton plants, it is observed that "closer spacing of the plants in the row has been adopted in the field plantings at the station, with results which seem to justify the more extensive use of this method in the section. The distance apart which the plants have heretofore been spaced was 24 in., but this distance has been reduced to 12 in. or less."

In experiments on the spacing of milo maize, it was found that spacing had comparatively little effect on the yields, but the highest yields were obtained from relatively close spacing. The most important effect of spacing was the decreased number of heads and of tillers per plant when the plants were relatively close together within the row. "The benefit derived from having few tillers lies in the fact that few tillers favor early and uniform maturity. On June 28, when 90 per cent of the heads on the close-spaced plants (those left unthinned and those thinned to 2 in.) were ripe, less than 70 per cent of the heads on the wider spaced plants had reached maturity. Early and uniform maturity lessens the danger of damage by the sorghum midge, and the results obtained in 1913 strongly indicate that closer spacing than has usually been practiced will result in earlier and more uniform maturity."

Results of variety tests with cotton, grain sorghums, and corn, are also given.

The work of the Umatilla reclamation project experiment farm in 1913, R. W. ALLEN (*U. S. Dept. Agr., Bur. Plant Indus., Work Umatilla Expt. Farm, 1913, pp. 1-5, 9, 10-12, 13, 14, figs. 2*).—This publication gives an account of the work carried on jointly by the Oregon Station and this Department at the

Umatilla experiment farm located about two miles north of Hermiston, Oreg., and along the same general lines as that of 1912 (E. S. R., 29, p. 540). Climatic, agricultural, and market conditions of the project are discussed, as well as soil-fertility experiments, green manure crops, irrigation methods, and extension work.

Variety tests of potatoes gave yields up to 142.4 bu. per acre (by American Wonder). A variety test of peanuts gave yields up to 28.4 bu. per acre (by African). It is noted that conditions are not favorable for growing peanuts for commercial purposes. Of seven varieties of corn tested for grain and silo purposes Pride of the North apparently gave the most satisfaction, with a yield of 5,073 lbs. per acre of cured grain and stover combined.

Cereal experiments at Dickinson, N. Dak., J. A. CLARK (*U. S. Dept. Agr. Bul. 33 (1914), pp. 44, pl. 1, figs. 7*).—This bulletin reports upon the testing and improvement of cereal varieties that have been carried on since 1907 by the Bureau of Plant Industry, in cooperation with the North Dakota Station (E. S. R., 24, p. 725). The soil and climatic conditions at the station are discussed.

The methods employed in the field experiments are described. Two methods of determining the comparative or computed yields of the varieties by the use of check plats were used at various times. The equations employed are given as $x = a + (b - y)$ and $x = a \div y \times b$ or $ab \div y$, wherein a is the actual yield of the variety, b the average yield of all check plats, x the computed yield of the variety, and y the assumed yield of the check. The latter is noted as proving the more satisfactory of the two.

Actual and computed yields of variety tests of over 50 varieties of spring wheat are given in tabular form. The results show that for the different groups "the durum, fife, bearded fife, and bluestem varieties rank in yield in the order named. The average actual yield for 6 years (1907-1911 and 1913) of the 2 leading durum varieties (Kubanka and Arnautka) is 11.5 per cent greater than the average yield of the 2 leading fife varieties (Ghirka Spring and Rysting) and 29.4 per cent greater than the average yield of the 2 leading bluestem varieties (Crossbred and Haynes). There is little difference in the yield of the fife and bearded fife varieties."

A few varieties of outstanding merit of each group are described and their performance discussed.

From a study of the milling and baking qualities of the crops of 1911 and 1913, the author concludes that "the bluestem group averaged the greatest percentage of flour, with the durums a close second. The bearded fife and fife varieties averaged practically the same, the yield being considerably less than that of the bluestems. The durum variety Kubanka No. 8 gave the highest average percentage of flour for any one variety, 73.9 per cent. Bakings, which were made in duplicate from these flours, showed the volume of the loaf of the bluestem varieties to be the largest, that of the fife varieties next largest, with the bearded fife and durums following in the order named. The fife variety White Fife (C. I. No. 3319) gave the greatest average volume (2,370 cc.) to the loaf."

In testing oats, four groups were recognized, medium early, medium late, early, and late, and these ranked in point of yield in the order named. "The average actual yield for the seven years from 1907 to 1913 for the 2 leading medium-early varieties is 12.5 per cent greater than the average actual yield of the 2 leading early varieties. For the five years 1908, 1909, and 1911 to 1913, the average actual yield of the leading medium-early variety is 13 per cent greater than that of the medium-late variety, 17 per cent greater than that of the leading early variety, and 36.5 per cent greater than that of the late one.

The same relative relation exists between the leading varieties of the different groups for the four years 1909, 1911-1913, when both the actual and computed yields can be compared."

The leading varieties in each group of oats are described.

In the experiments with barley, three groups were recognized, 2-rowed hulled, 6-rowed hulled, and 6-rowed naked. A summary of the test shows that "the 2-rowed barleys have outyielded the 6-rowed in all the years they have been tested. In a 5-year period (1908-1911 and 1913) the 2 leading 2-rowed varieties have an actual average yield 34 per cent greater than that of the 2 leading 6-rowed hulled varieties and 75 per cent greater than that of the 6-rowed naked variety. In the 4 years 1909-1911 and 1913, the average actual yield of the leading 2-rowed variety is 32 per cent greater than that of the leading 6-rowed hulled variety, and 76 per cent greater than that of the 6-rowed naked variety. The average computed yield of the leading 2-rowed variety for the same period is 25 per cent greater than that of the leading 6-rowed hulled variety and 58 per cent greater than that of the naked variety."

Of all the varieties tested, the 2-rowed varieties Hannchen and Svanhals have proved best adapted to the conditions at Dickinson. The leading variety under each of the three groups is described. Brief notes on the tests of other cereals, emmer, rye, flax, proso, and some grain sorghums, are also given.

A brief account of nursery trials and pure-line selections showing the possibilities of improvement of cereals for the Dickinson territory is given.

In summarizing the experiments the author points out that spring varieties of all cereals, except rye, are better adapted to this region than winter varieties; that Kubanka is the leading variety of durum and Ghirka of life wheats; and that the Early Mountain variety of oats has given the highest actual yield for the 7 years, 54.1 bu. per acre, but on 4-year and 5-year averages, the Golden Rain has given the highest average yield.

Growth of maize seedlings in relation to temperature, P. A. LEHENBAUER (*Abd. in Physiol. Researches, 1 (1914), No. 5, pp. 247-288, figs. 3*).—"In the experiments here discussed an attempt has been made to keep all the conditions for growth considerably more uniform than has usually been the case with earlier investigations of this sort. Maize seedlings were used, grown practically in darkness and with approximately constant temperature. The relative humidity of the air was always very close to 95 per cent. Due attention was also given to the time factor in its relation to the rates of growth at the different temperatures. Measurements of the growth increments of the shoots were hourly in most cases, and observation was continued for periods ranging in length from 12 to 39 hours. The main results and conclusions brought out by a study of the detailed data presented in the tables, are summarized below.

"The somewhat widely accepted idea that the curve of growth in relation to temperature shows two optima is not at all substantiated . . . The optimum temperature for growth of shoots of maize seedlings in water culture, for a 12-hour period, is shown to be 32° C. [89.6° F.].

"The optimum temperature for growth, under these conditions, is found to change as the length of the period of exposure is altered.

"At high temperatures (31° and above), for shoots of maize seedlings under these experimental conditions the initial growth-rate is not maintained, there being a marked falling off in this rate during prolonged periods of exposure. This decrease in the growth rate with prolonged periods at high temperatures makes it necessary to consider the length of the periods for which average growth rates are obtained, in defining the optimum for growth of these shoots. Indeed, it appears that the term optimum temperature for growth, in this case at least, is quite without meaning unless the length of the period of exposure

is definitely stated. The fall in growth rate here brought out is similar to the decrease in rate of certain other physiological processes under the influence of high temperatures during prolonged periods.

"At temperatures near the minimum (12-14°) for the growth of shoots of maize seedlings under the conditions here employed, no decrease in the growth rate is shown, even with rather prolonged periods of exposure.

"The growth rate at medium temperatures accords with the van't Hoff law, showing a doubling of the rate for each rise of 9 or 10° C."

Fertilizers for potatoes, W. P. BROOKS (*Massachusetts Sta. Circ.* 42 (1914), pp. 4).—A revision of Circular 26, previously noted (E. S. R., 23, p. 731).

On the "dead grains" of rice, G. SILVESTRI (*Ann. Chim. Appl. [Rome]*, 1 (1914), No. 5-6, pp. 212, 213).—This article discusses the appearance and methods of separating the so-called "dead" or immature grains found in rice, which it is stated often reach 25 per cent of the harvest. An analysis of this inferior rice is given as moisture 15.01, ash 1.74, protein 7.18, starch 66.4, and fat, cellulose, and undetermined matter 9.67 per cent.

Perennial rye grass seed, A. H. COCKAYNE (*Jour. Agr. [New Zeal.]*, 8 (1914), No. 6, pp. 619-639, figs. 70).—This is a profusely illustrated article giving results of a study of the perennial rye-grass seed industry of New Zealand, including data as to bushel weight, purity, presence of ergot, germination, and adulteration. An illustrated list of 63 adulterating seeds is given.

It is noted that "the average yield is about 500 lbs. per acre of undressed seed, but in seasons when bad weather is experienced the average may not exceed 400 lbs., while in exceptionally favorable years the yield may be as high as 650 lbs. In individual cases over 1,200 lbs. per acre may be harvested, but these are really exceptional, and are mainly restricted to crops from young pasture."

The grain sorghums, O. O. CHURCHILL and A. H. WRIGHT (*Oklahoma Sta. Bul.* 102 (1914), pp. 70, figs. 31).—This bulletin discusses grain sorghums with special reference to Oklahoma conditions and treats of their history, distribution, classification, seed and seed selection, standard of perfection, soils and soil management, methods of cultivation, harvest, rotation, storing, handling, and uses, including composition of the grain, insect enemies, and diseases.

In discussing moisture requirements the results of pot experiments are given that show the influence of 5, 10, 15, 20, 25, 30, and 40 per cent water content of soil on Kafir corn, milo maize, corn, broom corn, and oats. Practically no growth with broom corn or oats occurred in the pots containing 5 or 10 per cent of moisture.

"In all series the amount of water required to produce a pound of dry matter decreased as the water content approached 25 per cent. This is approximately 55 per cent of the total water-holding capacity of the soil. The amount of water required to produce a pound of dry matter increased above this per cent. This indicates that plants make the most economical use of water in this soil when the moisture content is about 20 per cent. . . .

"From 15 to 30 per cent moisture the growth increased nearly in proportion to the increase in moisture present. The plants grown in soil containing 40 per cent moisture did not show any decided increase in dry matter over those grown in 30 per cent. . . .

"The sorghums grew and produced well with 15 per cent of water in the soil.

"This test indicates that Kafir and milo will grow and produce fair crops when the water content of the soil is too low for the production of corn."

In a series of pot tests run to determine the wilting coefficient of corn, oats, Kafir corn, milo maize, and cowpeas, the recorded results show that it requires a longer period of time for the grain sorghums to reach the wilting point than

it does oats and corn. Cowpeas were next to the grain sorghums in this respect. Oats removed more of the moisture from the soil before wilting than any other plants grown, cowpeas ranked next to oats, corn third, Kafir corn fourth, while milo maize left more of the moisture in the soil at its wilting point than any of the other crops.

From the wilting coefficient for the plants as determined, it is shown that the drought-resistant character of the grain sorghums is not directly due to their ability to use the soil moisture down to the lowest extent.

When two kinds of plants were grown together in the same soil mass, corn died before oats, Kafir corn, and milo maize, and in one case it died before cowpeas. Kafir corn grown in combination with other crops was in every case the last to die.

In experiments regarding the depth of plowing, it is noted that "soils of a silty character were plowed to a depth of 5, 10, and 15 in. Just previous to the plowing each year samples were taken to a depth of 15 in. in each series. In each case for 3 successive years it was found that the soils which were plowed to a depth of 15 in. were just as hard and compact in structure as those which were plowed to a depth of 5 in. There was no residual effect upon the soil from deep plowing. The effect entirely disappeared at the end of the first season. It may be further stated that in plowing the second and third years the 5-in. plowed plats were just as easily turned as were the 10 and 15-in. plowed plats. This leads us to believe that extra deep plowing, that is, over 7 in., is not profitable on this type of soil."

It is noted as results of trials, that Kafir corn should be planted about April 10 in the southern part of Oklahoma and about May 20 in the northern part. Feterita and milo maize may be planted about ten days later than Kafir corn.

The crops on the experimental sugar-cane fields, 1913, J. B. HARRISON, C. K. BANCROFT, and R. WARD (*Jour. Bd. Agr. Brit. Guiana*, 8 (1914), No. 1-2, pp. 45-57).—This article gives results of variety, manurial, and cultural tests with sugar cane.

In a study of the effect of manures, the mean returns on 39 varieties as ratoon canes with normal and high manurings, 300 lbs. and 450 lbs. of sulphate of ammonia per acre respectively, were 19 and 22.5 tons per acre respectively, as compared with 11.1 tons from the untreated area. Sulphate of ammonia is noted as a better source of nitrogen than nitrate of lime, nitrolime, or nitrate of soda, the mean annual increases for four years by the use of 60 lbs. of nitrogen in the various forms being 9.4, 6.7, 5.9, and 4 tons of cane per acre over the untreated area. The use of dried blood is noted as being far from satisfactory.

It is shown that in normal seasons the addition to sulphate of ammonia of sulphate of potash and superphosphates of lime actually reduced the yield. The addition of phosphates to nitrogen fertilizers produced increased yields, but these increases were not remunerative. Molasses in 100-, 200-, and 300-lb. rates has given negative results with cane (*E. S. R.*, 30, p. 822). No advantage was shown by the partial sterilization of the soil by the application of chlorinated lime, yields being lower this year on the treated plats.

Winter-wheat varieties for the eastern United States, C. E. LEIGHTY (*U. S. Dept. Agr., Farmers' Bul.* 616 (1914), pp. 14, figs. 6).—This deals principally with the soft red and soft white winter wheats adapted to the eastern half of the United States, and discusses the two transition zones, the one chiefly in northern Iowa and southern Minnesota between the district which grows only winter and that which grows only spring wheat; the other in southern Iowa, southeastern Nebraska, eastern Kansas, central Oklahoma, and northern-cen-

tral Texas between the districts adapted to the hard red winter wheats and the soft red winter wheats. The varieties of soft red winter wheat and of soft white winter wheat best adapted for each State of the different sections of the country under discussion are enumerated.

A classification is given of the adapted varieties, grouped according to some of the most obvious and most easily determined characters.

Some Kentucky weeds and poisonous plants, H. GARMAN (*Kentucky Sta. Bul.* 183 (1914), pp. 255-339, pls. 43).—This lists and describes some poisonous plants and weeds found in pasture land and meadow fields in Kentucky, and notes ergot and corn molds as sources of trouble for cattle.

HORTICULTURE.

[Report on horticultural work at the San Antonio station, 1913], S. H. HASTINGS (*U. S. Dept. Agr., Bur. Plant Indus., Work San Antonio Expt. Farm, 1913*, pp. 9, 10, figs. 2).—A brief statement of progress made in cultural and variety tests of fruits and ornamentals.

Owing to late spring frosts there was practically no fruit crop. The Gonzales plum set a heavy crop and is considered the most reliable variety that has been under trial. The Rusk citrange fruited for the first time in 1913 and is believed to be particularly well adapted to San Antonio conditions. Of nine varieties of pomegranates the San Pipetos, De Jative, and Dessia varieties have produced the best fruits. A test of the resistance of various stocks to adverse soil conditions indicates that by the use of proper stocks many fruits heretofore considered not adapted to local conditions may be produced and also that many new fruits may be added to the list. The stocks receiving special attention are peaches, grapes, walnuts, plums, persimmons, and pears.

[Horticultural investigations at the Umatilla experiment farm, Oregon, in 1913], R. W. ALLEN (*U. S. Dept. Agr., Bur. Plant Indus., Work Umatilla Expt. Farm, 1913*, pp. 6-9, 12, 13, fig. 1).—A brief progress report on cultural and variety tests of fruits, vegetables, and ornamentals (*E. S. R.*, 29, p. 540), including lists of kinds which have thus far proved promising.

Cabbage, cauliflower, turnip, rape, and other crucifers, W. P. BROOKS (*Massachusetts Sta. Circ.* 38 (1914), pp. 4).—This circular contains practical instruction for soil management and fertilization in growing the above crops.

Suggested rules for naming garden vegetables (*Nebr. Hort.*, 4 (1915), No. 11, pp. 1, 2).—This comprises the report of the committee on nomenclature and varieties adopted by the Vegetable Growers' Association of America, Philadelphia, October, 1914.

Trees and shrubs hardy in the British Isles, W. J. BEAN (*London, 1914*, vols. 1, pp. XVI+688, pls. 36, figs. 124; 2, pp. VI+736, pls. 28, figs. 136).—Part 1 of this work contains historical notes relative to the introduction of trees and shrubs into the British Isles, and discusses the propagation, culture, and care of trees and shrubs. Trees and shrubs showing various distinctive characteristics with reference to their appearance and to their adaptability for different soils and situations are grouped together and discussed. A select bibliography of trees and shrubs is given.

Part 2 comprises a descriptive list of all the species and more important varieties of hardy woody plants established in cultivation, with notes on their distinctive characters, garden value, and culture.

Practical manual of fruit culture, E. DURAND (*Manuel pratique de Culture Fruitière. Paris and Montpellier, 1912*, pp. X+575, figs. 348).—In part 1 of this manual consideration is given to the general principles of fruit growing.

Part 2 deals with the specific culture of various orchard and small fruits in France. The concluding chapter discusses harvesting, conservation, and uses of fruits, including the construction and management of storehouses.

Minnesota state fruit breeding farm in 1914, C. HARALSON (*Minn. Hort.*, 43 (1915), No. 1, pp. 19-25, figs. 3).—A popular progress report of work at the Minnesota fruit breeding and testing farm. As a result of the plant breeding to date, two varieties of everbearing strawberries, several June-bearing varieties, seven varieties of grapes, seven of raspberries, two of gooseberries, and sixteen of plums have been originated and are believed to be worthy of trial, whether for commercial purposes or for private use.

An experiment in dry-land orcharding, B. MACKENSEN (*Bul. Sci. Soc. San Antonio, Tex.*, 1 (1914), No. 2, pp. 35-43, pls. 2).—In the experiment here described the author planted a small orchard about 11 years ago on a dry hillside near San Antonio, Tex. The orchard has been grown without the use of irrigation water other than that caught by a series of ditches during rain storms.

The results in general indicate that orcharding without irrigation in the San Antonio region is a risky undertaking, although certain well-acclimated varieties may be grown by conserving the storm waters, providing thorough tillage and other up-to-date orchard practices are employed.

Directions for sending fruits for identification, J. K. SHAW (*Massachusetts Sta. Circ.* 46 (1914), pp. 4).—This circular contains rules for the guidance of those desiring to submit specimens of fruits or nursery stock to the station for identification or for any other purpose.

Lime and sulphur solutions, G. E. STONE (*Massachusetts Sta. Circ.* 39 (1914), pp. 4).—A revision of Circular 31 of the same series (E. S. R., 26, p. 741) containing practical directions for the preparation of homemade lime-sulphur mixtures.

The cherry, F. PENEVEYRE (*Le Cerisier. Paris and Villefranche (Rhône)*, [1914], pp. 61, figs. 22).—A small popular French treatise on the propagation, culture, and care of cherry trees.

Growing peaches: Sites, propagation, planting, tillage, and maintenance of soil fertility, H. P. GOULD (*U. S. Dept. Agr., Farmers' Bul.* 631 (1915), pp. 24, figs. 8).—This is the first of a series of three farmers' bulletins dealing with the general subject of peach growing. In the preparation of the series the author has freely consulted the more important experiment station literature on the subject, as well as many other sources of information. The present bulletin discusses the phases noted in the title. U. S. Census statistics relative to peach growing in the United States are also given.

Growing peaches: Pruning, renewal of tops, thinning, interplanted crops, and special practices, H. P. GOULD (*U. S. Dept. Agr., Farmers' Bul.* 632 (1915), pp. 23, figs. 19).—In continuation of the above, the present publication discusses a number of other fundamental peach orchard operations as listed in the title.

Growing peaches: Varieties and classifications, H. P. GOULD (*U. S. Dept. Agr., Farmers' Bul.* 633 (1914), pp. 13).—This is the third of the series on peach growing as noted above. The author here presents lists of peach varieties showing the approximate dates and sequence of ripening in different sections arranged by States and counties. The classification of peaches into races is also briefly considered, including information on the general regional distribution of the different races.

A new walnut, E. B. BABCOCK (*Jour. Heredity*, 6 (1915), No. 1, pp. 40-45, figs. 4).—A popular account of the author's investigations and conclusions with reference to the origin of the Quercina walnut (E. S. R., 32, p. 46).

The coconut, E. B. COPELAND (*London, 1914, pp. XIV-212, pls. 19, fig. 1*).—A popular treatise on the coconut with special reference to Philippine conditions. The subject matter is discussed under the general headings of the origin of the coconut, physiology, climate and soil, diseases and pests, selection and treatment of seed, field culture, and coconut products.

The economic properties of some hardy ornamental fruits, W. DALLIMORE (*Roy. Bot. Gard. Kew, Bul. Misc. Inform., No. 9 (1914), pp. 339-345*).—Popular notes are given relative to the economic use of the fruits of various ornamentals.

Garden notes on new trees and shrubs, W. J. BEAN (*Roy. Bot. Gard. Kew, Bul. Misc. Inform., No. 6 (1914), pp. 201-205, pls. 2*).—Descriptive notes are given on a number of new rhododendrons being tested at the Kew Gardens.

The practical book of outdoor rose growing for the home garden, G. C. THOMAS, JR. (*Philadelphia and London, 1914, pp. 157, pls. 104*).—A popular treatise dealing particularly with rose growing in the approximate climate of the Middle Atlantic States. In addition to cultural directions lists are given of various types of roses which have been systematically tested for a number of years. The text is accompanied by color photographs made from the varieties tested.

Sweet peas for profit, J. H. DICK (*New York, 1914, pp. 147, figs. 42*).—A practical guide to commercial sweet pea growing, both under glass and outdoors.

FORESTRY.

Norway pine in the Lake States, T. S. WOOLSEY, JR. and H. H. CHAPMAN (*U. S. Dept. Agr. Bul. 139 (1914), pp. 42, pls. 6, fig. 1*).—This bulletin discusses the Norway pine with reference to its importance, range, requirements upon soil, moisture, and climate, botanical characteristics and life history, forest types, associating species, supply and cut, grades, prices, markets, uses, and management.

The subject matter is based upon field work conducted under the supervision of the authors, together with data collected by correspondence. A number of volume tables are appended.

Pine plants and seed from dissimilar habitats, G. SCHOTTE (*Skogsvårdsför. Tidskr., No. 12 (1914), pp. 727-773, figs. 18*).—A contribution relative to the influence of environment on forest seed, based on investigations conducted under the direction of the Swedish Forest Experiment Station. The author presents comparative data showing the growth performance of pine seedlings raised from seed procured from different districts in Swedish and several other European countries.

Basket willow culture, G. N. LAMB (*U. S. Dept. Agr., Farmers' Bul. 622 (1914), pp. 34, figs. 24*).—This discusses the different varieties of basket willows and methods of willow growing which have been found most satisfactory as a result of experiments conducted at the Forest Service willow farm at Arlington, Va., and a study of willow holt established throughout the country. The opportunities for marketing the products of the holt, and the cost of establishment and maintenance, are also discussed.

The important vegetable products of the French Colonies.—I, Rubber, E. PERROT (*Les Grands Produits Végétaux des Colonies françaises. I, Le Caoutchouc. Paris, 1914, pp. 101, pls. 12, figs. 24*).—A monograph on the botany, culture, and preparation of rubber with special reference to the present status and future development of the rubber industry in the French colonies.

Manurial experiments with young rubber at Kuala Lumpur, F. G. SPRING (*Agr. Bul. Fed. Malay States, 3 (1914), No. 1, pp. 9-14*).—Data are given on

the third season's results with various combinations of lime, nitrogen, phosphorus, and potash. Generally speaking a somewhat increased growth has resulted from fertilization thus far, although no deductions as to the economic value of the fertilizers can be made until the trees have been tapped for some time.

Studies on the application of stereophotogrammetry for forest geodetic purposes, H. Dock (*Centbl. Gesam. Forstw.*, 39 (1913), Nos. 11, pp. 484-497, figs. 5; 12, pp. 529-547, figs. 9).—An exposition on the use of a field phototherdolite for making various forest measurements.

Instructions for appraising stumpage on National Forests (U. S. Dept. Agr., Forest Serv., *Instructions for Appraising Stumpage on National Forests* (1914), pp. 70).—The instructions herein given supplement the Timber Sales Manual (E. S. R., 26, p. 340). They are meant to standardize the principles and methods followed in stumpage appraisals upon National Forests and are for the exclusive use of National Forest officers.

Annual report on the forest administration in Ajmer-Merwara for 1912-13, HUKAM CHAND (*Ann. Rpt. Forest Admin. Ajmer-Merwara, 1912-13*, pp. 3+30).—A report similar to the above relative to the administration of the state forests of Ajmer-Merwara for 1912-13.

Annual administration report of the forest department of the Madras Presidency for the twelve months ending June 30, 1913, A. W. LUSHINGTON, H. B. BRYANT, J. S. BATTIE, F. A. LODGE, and F. C. L. COWLEY-BROWN (*Ann. Admin. Rpt. Forest Dept. Madras, 1913*, pp. 90+CX XXV+17).—This comprises the usual progress report on the administration and management of the state forests in the Northern, Central, Southern, and Western Circles of the Madras Presidency, together with a report of the Madras Forest College for the year ended June 30, 1913. Data relative to forest areas, forest surveys, working plans, silvicultural operations, yields, revenues, expenditures, etc., are appended in tabular form.

DISEASES OF PLANTS.

The organization in various countries of the service for the protection of plants, J. M. SAULNIER (*Le Service de Protection des Plantes dans les Divers Pays. Rome: Inst. Internat. Agr.*, 1914, 3. ed., pp. XVI+355, pl. 1).—This is a revised edition of a previous publication (E. S. R., 31, p. 145), the number of countries now reported being 42.

Control of crop diseases in Nebraska, E. M. WILCOX (*Ann. Rpt. Nebr. Corn Improvers' Assoc.*, 5 (1914), pp. 69-84, figs. 8).—This is a brief discussion of fungus diseases, chiefly rusts and smuts of cereals in Nebraska as at present known, including modes of infection, life history, and control.

Scientific and technical studies on plant diseases (*Bol. Min. Agr., Indus. e Com. [Rome], Ser. B*, 13 (1914), No. 2, pp. 38-49).—This is a brief account of the work of the station for vegetable pathology at Rome since 1887, with a list of publications thereof, also an account of treatments tested by the school of pomology and horticulture at Florence for diseases and animal enemies of orchard, garden, and ornamental plants, and a list of publications on vegetable pathology of the school of viticulture and enology at Avellino.

The diseases and injuries of tropical cultivated plants and their control, F. ZACHER (*Die wichtigsten Krankheiten und Schädlinge der tropischen Kulturpflanzen und ihre Bekämpfung. Hamburg, 1914, vol. 1*, pp. VIII+152, figs. 58).—In this volume, which is the first of a series treating of plant diseases and other injuries to tropical plants, the author describes general injuries to cultivated plants and the diseases and insect pests of cotton, cacao, coffee, and tea. Subsequent volumes are to include similar accounts of other tropical crops.

Notes on the nomenclature of some rusts, J. RAMSBOTTOM (*Brit. Mycol. Soc. Trans.*, 4 (1913), pt. 2, pp. 331-340).—The author discusses the synonymy of a number of species of rusts, calling attention to the errors in this respect in two recent books by Grove and Massee (*E. S. R.*, 30, p. 745).

A new gymnosporangial connection, F. D. FROMME (*Mycologia*, 6 (1914), No. 5, pp. 226-230).—The author reports another exception to the formerly assumed restriction of æcial stages of Gymnosporangium to the family Rosaceæ, previous exceptions having been noted by Arthur (*E. S. R.*, 26, p. 645).

Observations and inoculations have now, it is claimed, extended the list to include the Myricaceæ by establishing the identity of *Æcidium myricatum* with *G. ellisii*. A description is given of the new combination under the name *G. myricatum*.

Observations on pure cultures of some Ascomycetes and Basidiomycetes, F. T. BBOOKS (*Brit. Mycol. Soc. Trans.*, 4 (1913), pt. 2, pp. 239-248).—By means of cultures grown upon wood under sterile conditions the author has succeeded in reproducing a number of basidiomycetous and ascomycetous fungi.

In his investigations he found that *Chlorosplenium æruginosum*, which occurs on many species of wood, is undoubtedly the cause of greening of the wood, as has been claimed. He was also able to associate the *Ozonium* with *Coprinus* sp. from spores transferred to blocks of elm wood.

In addition to the above he has succeeded in producing fruiting forms of *Daldinia concentrica*, *Hydnum coralloides*, *Fomes ignarius pomaceus*, and *Pleurotus ostreatus*.

Eelworms, W. LAIDLAW (*Jour. Dept. Agr. Victoria*, 12 (1914), No. 6, pp. 370-377, figs. 3).—The author discusses briefly the anatomy and life history of nematodes, in particular of *Heterodera radiculicola* in potato. Experiments with remedial or preventive measures in progress are said to show promise, but are not yet reported in complete form.

Control of streak disease of barley, TRITSCHLER (*Illus. Landw. Ztg.*, 34 (1914), No. 53, pp. 501, 502, fig. 1).—Treatments of winter barley seed for *Pleospora trichostoma* (*Helminthosporium gramineum*) with 0.5 per cent copper sulphate, 0.1 per cent formalin, or 0.1 per cent mercuric chlorid, each in various combinations as regards temperatures of previous soakings in water, etc., are reported, the results being given in tabular form. The author states that neither corrosive sublimate nor formalin gave uniformly satisfactory protection to seed grain without excessive injury to germinability, but that better results were obtained by soaking the seed in 0.5 per cent copper sulphate, germinability in this case reaching 92 per cent in sand and 80 per cent in field tests.

Stinking smut of wheat, H. C. MÜLLER and E. MOLZ (*Fühling's Landw. Ztg.*, 63 (1914), No. 6, pp. 204-214).—Results are given in considerable detail of seed treatments for protection of wheat against smuts, and of studies on the influence of seeding time on attack therefrom. Treatment of seed with formaldehyde, followed by the cold and hot water treatment, gave a satisfactory degree of protection without serious injury to germinability.

Parasitic diseases of cultivated composites, L. MANGIN (*Rev. Hort. [Paris]*, 86 (1914), No. 9, pp. 205-207, figs. 3).—Besides a brief discussion of a few other fungus diseases, illustrations are given of *Bremia lactuce* on lettuce, *Albugo tragopogonis* on salsify, and *Ramularia cynaræ* on artichoke.

Celery leaf spot disease or blight (*Dept. Agr. and Tech. Instr. Ireland Jour.*, 14 (1914), No. 3, pp. 540-543, figs. 3).—Symptoms and methods of control of celery blight are discussed, the latter including the use of guaranteed seed only, spraying on its first appearance with Bordeaux or Burgundy mixture,

the removal and burning of all infected leaves or plants, and the use of fresh land each season for celery.

Cotton wilt and root knot, W. W. GILBERT (*U. S. Dept. Agr. Farmers' Bul. 625 (1914), pp. 21, figs. 15*).—Popular descriptions are given of the cotton wilt due to *Fusarium vasinfectum* and the root knot caused by *Heterodera radicola*. For their control the author recommends thorough rotation of crops and the growing of varieties that are known to be resistant to these pests.

Downy mildew of cucumbers, G. E. STONE (*Massachusetts Sta. Circ. 40 (1914), pp. 2, fig. 1*).—A description is given of the downy mildew of cucumbers due to *Peronoplasmodium cubensis*, which is said to be one of the most troublesome pests in cucumber culture under glass.

The author states that the disease is not necessarily difficult to hold in check if proper attention is paid to the moisture of the house. In no case should moisture be allowed to remain on the foliage for more than 2 or 3 hours, and even during the warm months steam should occasionally be turned on so as to dry out the house and change the air.

The control of onion smut, G. E. STONE (*Massachusetts Sta. Circ. 41 (1914), pp. 4, figs. 4*).—The author states that positive results on the control of onion smut have been obtained by applying sulphur at the rate of 100 lbs. per acre thoroughly mixed with 50 lbs. of air-slaked lime in the drills, or by the application of ground lime at the rate of from 75 to 100 bu. per acre. The best results, however, have been obtained by the use of formalin at the rate of 1 oz. to 1 gal. of water, or in even weaker solutions, the formalin solution being applied to the row as the seed is planted. A device for the application of the formalin is fully described.

Some diseases of the potato.—III, Black scab or warty disease, ETHEL M. DOIDGE (*Agr. Jour. Union So. Africa, 8 (1914), No. 1, pp. 50–55, pl. 1, figs. 3*).—This is a brief descriptive discussion of the disease known as potato canker, etc., due to *Synchytrium endobioticum* and noted at several points in Europe and America, but not in South Africa. A map of England showing infected areas is given. Varieties claimed to be more or less resistant, and also the soil treatment with 1 per cent formalin recommended by Eriksson (*E. S. R.*, 31, p. 82), are mentioned.

Leaf blotch in the potato, A. S. HORNE (*Jour. Roy. Hort. Soc. [London], 39 (1914), No. 3, pp. 595–606, pls. 6, fig. 1*).—The author reports in considerable detail on a continuation of investigations previously noted (*E. S. R.*, 25, p. 750) as carried out on leaf blotch in the President potato.

It is stated that crops of this variety produced in light sandy soil at Wisley, in 1912 and 1913, were very small. A considerable proportion of defective plants occurred, some plants growing only a few inches in height and bearing only two or three small tubers. Both good and bad plants flowered at Wisley, but did not produce seed. *Macrosporium solani* was not noted at this place. Tubers from diseased plants generally transmitted the defect, but one such tuber placed in different environment produced a plant with good foliage. Both good and bad plants were produced at Wisley from tubers of medium size taken from different localities. The tubers were very variable in shape, size, eye characters, texture, and kind of skin, but occurrence of affected plants did not appear to be in any way related to these characters or to injuries suffered by the tubers or shoots.

Leaf roll of potatoes and related diseases, R. SCHANDER (*Fühling's Landw. Ztg.*, 63 (1914), No. 7, pp. 225–243).—This is a brief general summary of different diseases usually characterized more or less by curling of the leaves, with a discussion of possible remedial measures therefor, such as breeding, soil selection and improvement, drainage, cultivation, and spacing.

Leaf roll of potato, G. KÖCK (*Wiener Landw. Ztg.*, 64 (1914), No. 41, pp. 382, 383, fig. 1).—The author shows the progress of the organism associated with leaf roll of potato in the vascular system of the stems attacked. It gains entrance probably at some superficial wound and spreads finally to or through the vascular system of the tubers on such shoots, other shoots from the same parent tuber in some cases remaining free from the disease. A secondary infection may or may not spread from infected tubers to plants produced therefrom. Tubers borne by infected shoots may be simply weakened without being actually reached by the fungus.

Spraying potatoes for the prevention of potato disease or late blight, T. MILBURN and R. C. GAUT (*County Council Lancaster, Ed. Com., Agr. Dept., Farmers' Bul.* 27 (1914), pp. 25).—Giving methods and results of experiments during eight years looking to protection of potatoes against late blight (*Phytophthora infestans*) by the employment of various liquid and dry fungicides, the authors state that in most cases spraying reduced the loss, especially when the outbreak occurred late in the summer, and that the crops from sprayed plats also kept better than others. On the whole, however, spraying is not to be unreservedly recommended, since especially on stiff, retentive soils and near manufacturing towns the fungicides in either wet or dry form may spot and dwarf the foliage and decrease the crop.

Sprayed crops when not greatly injured usually retain their leaves longer than unsprayed in diseased areas, and thereby yield a larger total crop with a smaller percentage of brown tubers; but when the tops are injured, crops may be considerably decreased. No efficient fungicide has as yet been found to be without at least occasional injury to the potato foliage or crop, but if the disease appears late the injury is relatively small and is overbalanced by the benefit. Spraying twice in the season is regarded as causing too much risk unless the disease appears early and threatens to progress rapidly. On the whole, the single late spraying as soon as the disease appears on the most susceptible area has given the best results, but this point is considered to require further investigation.

The use of Burgundy mixture for Irish blight (*Agr. Gaz. N. S. Wales*, 25 (1914), No. 1, pp. 48-50).—Though it is said that up to the present time the most successful method of attacking late blight of potatoes in New South Wales has been the use of Bordeaux mixture, it is claimed that recent experience in parts of Ireland has indicated a degree of superiority for Burgundy mixture for this purpose. Directions are outlined for the preparation and use of the latter fungicide, with the advantages claimed therefor.

Phytophthora arecæ causing a rot of potato tubers, J. ROSENBAUM (*Phytopathology*, 4 (1914), No. 5, p. 387).—As a result of cross-inoculation work with several species of *Phytophthora*, the author claims to have found that *P. arecæ* is able to cause a rot of the potato tuber. The rot caused resembles in every respect the pink rot previously described as caused by *P. erythroseptica* (E. S. R., 31, p. 543). Comparisons of the two species lead the author to believe that they are at least closely related, if not identical.

Fungus enemies of the sweet potato in Indiana, C. A. LUDWIG (*Proc. Ind. Acad. Sci.*, 1912, pp. 103, 104).—According to the author stored sweet potatoes in Indiana have been found infected with *Rhizopus* spp., *Nectria ipomææ*, *Penicillium* spp., *Diaporthe batatatis*, *Sphaeronema fimbriatum*, and *Fusarium* spp.

Blossom-end rot of tomatoes, C. BROOKS (*Phytopathology*, 4 (1914), No. 5, pp. 345-374, pls. 3, figs. 5).—The results of an extended study on the blossom-end or point rot of tomatoes, a disease of general occurrence in the United

States and also reported from Canada, Cuba, Australia, New Zealand, and various parts of Europe, are given.

A number of causes have been assigned for this disease, but the author's experiments indicate that it is not primarily due to bacteria or fungi, as is often claimed. Either excessive watering or a sudden check in the water supply may produce the disease, and certain fertilizers also tend to increase it. Among the fertilizers that have been found to increase the blossom-end rot are ammonium sulphate, dried blood, cotton-seed meal, and stable manure. The author is of the opinion that the increase in the disease from heavy applications of water and fertilizers is due to the development of harmful humic and ammonium compounds and an accompanying decrease in nitrates.

A bibliography is appended.

On the presence of hibernating mycelium of *Macrosporium solani* in tomato seed, IVY MASSEE (*Roy. Bot. Gard. Kew, Bul. Misc. Inform.*, No. 4 (1914), pp. 145, 146, pl. 1).—This is a condensed account of the relations of *M. solani*, causing black rot of tomato, to its host. The hyphæ are said to be of both intercellular and intracellular habit, or they may form a web of mycelium surrounding the seed and held in place, despite ordinary cleaning processes, by hairs of the testa. All seed from diseased fruit is to be rejected.

Rejuvenation of fruit stock, G. LOTRIONTE (*Staz. Sper. Agr. Ital.*, 46 (1913), No. 11-12, pp. 724-754).—This is a discussion of several treatments designed for use with diseased or declining olive trees, grapevines, and various other fruit or ornamental plants, including soil management and use of fungicides and insecticides. Directions and formulas are indicated in some detail.

Apple cracking and apple branch blister, P. A. VAN DER BIJL (*Agr. Jour. Union So. Africa*, 8 (1914), No. 1, pp. 64-69, figs. 6).—Noting the existence of *Coniothecium chomatosporum* on diseased apples sent in for examination, the author gives brief illustrated descriptions of the disease, and outlines such control measures as pruning, spraying in early spring with copper sulphate (1 lb. to 25 gal. water), and three later sprayings with Bordeaux mixture prepared according to directions given in the proportion of 4:4:50.

Studies in gummosis and frost injuries of cherry trees.—III, The wound stimulus theory, P. SORAUER (*Landw. Jahrb.*, 46 (1914), No. 2, pp. 253-273, pls. 2).—Reviewing results of former studies (*E. S. R.*, 28, p. 549; 31, p. 541), and also reporting upon recent investigations, the author claims to have shown to be untenable the theory that wound stimuli, whether of a traumatic or parasitic nature, necessarily produce gumming. An excess of certain enzymes may hinder normal cell wall formation, or may remove such structures by alteration or by solution under conditions of somewhat infrequent occurrence but not necessarily dependent upon previous injury to the plant.

Peach yellows and little peach, G. G. ARWOOD (*N. Y. Dept. Agr. Bul.* 61 (1914), pp. 1719-1742, pls. 35).—This includes statistics of diseased orchards covering 12 years, also a discussion of these diseases as related to fruit, shoots, and foliage, and graphic illustrations of the changes occurring during the progress of each disease in several different varieties.

The causation of these diseases has not been determined. It is held that the two diseases are distinct, being probably found on separate trees, that they are communicable, and that they spread rapidly from centers of infection, being transmitted apparently through seeds, buds, and pollen, but not through soil, even when young trees are planted where old ones showing the disease have stood. No curative measures have been found. Plums, apricots, almonds, and nectarines occasionally show symptoms of yellows milder than those noted in peaches. Neglect or delay quickly causes heavy losses, but prompt and

systematic removal of diseased trees (but not of diseased parts) greatly reduces losses from this cause.

Comparative tests with sprays against leaf cast of grape, A. BRETSCHNEIDER (*Ztschr. Landw. Versuchsw. Österr.*, 17 (1914), No. 3-4, pp. 106-118).—Continuing previous reports (E. S. R., 30, p. 50), the author gives some results of tests made with a number of commercial fungicides, including data as to the cost of materials employed.

Report on cryptogamic diseases of cacao at Mayumba, VERMOESEN (*Bul. Agr. Congo Belge*, 5 (1914), No. 1, pp. 186-202, fig. 1).—This is a brief systematic discussion of diseases affecting the roots, trunk, leaves, branches, and fruits of cacao in this region.

Mildew of cacao in the islands of St. Thomas and Principe, J. E. CARVALLO D'ALMEIDA (*Bol. Ofic. Sec. Agr. Cuba*, 17 (1914), No. 3, pp. 213-216).—Briefly describing the appearance, development, and effects of *Phytophthora faberi* as noted in its parasitic connection with cacao, the author states that timely use of Bordeaux mixture proves very helpful when it is made up in moderate to high concentrations as described, but that the frequent and abundant rainfall of these islands necessitates the addition of some adhesive.

Citrus canker, II (*Florida Sta. Bul.* 124 (1914), pp. 25-53, figs. 9).—An account is given of the citrus canker and its introduction into Florida, cause, and methods of control as far as they have been determined.

History of citrus canker, E. W. Berger (pp. 27-30).—This disease, it is claimed, was first recognized early in 1913. The first serious outbreak, however, was noted in a nursery in Dade County in July. The spread of the disease in other parts of the State as well as in the Gulf States generally is briefly indicated, and a statement given regarding the means that have been adopted for its control. From the evidence at hand the fungus seems to have been introduced from Japan on *Citrus trifoliata* stock.

Studies of citrus canker, H. E. Stevens (pp. 31-43).—In continuation of a preliminary account (E. S. R., 31, p. 54) the author describes laboratory and other studies on the cause of this disease and the conditions under which infection occurs and spreads. Successful inoculations were made in the fall of 1912 from material which was not then recognized as being different from the scab common to many citrus species. The fungus is provisionally classed among the Phyllostictas. While it is closely related to the stem-end rot fungus (*Phomopsis citri*), it is considered a much more virulent organism. Experiments are in progress to determine the vitality of the spores and the effect of different fungicides upon them. The rapidity with which the disease is spread is indicated by the fact that in an inoculation experiment on young shoots of grapefruit from a single spot on a leaf in October, 1913, the disease had spread until at the end of September, 1914, 561 infected leaves had been collected from the tree.

Eradication of citrus canker, F. Stirling (pp. 44-53).—The author describes the work that has been undertaken in Florida for the control of citrus canker, which is considered one of the most serious of citrus diseases. The work as outlined has been carried on mostly in Dade County. As treating the infected groves and nursery stock with fungicides or cutting them back and defoliating has not given satisfactory results, treatment with fire is considered as probably the only efficient means of control. The method adopted consists of burning the trees, grass, and soil beneath the trees with a spray of a flaming mixture of kerosene and crude oil. This is applied with a blow torch and the trees are quickly burned to a crisp. In a few instances where sprouts came up from the roots of the trees that had been burned no evidence was found of infection.

The varieties of citrus trees in the order of their susceptibility to this disease are as follows: Grapefruit, *Citrus trifoliata*, Persian lime, Key lime, navel orange, sweet orange, Satsuma, tangerine, mandarin, King orange, and lemon. Thus far the canker has not been observed on any noncitrus plant.

The rot of citrus fruit, G. L. FAWCETT (*Porto Rico Prog.*, 8 (1914), No. 1, pp. 5-7).—An account is given of an investigation of a rot of citrus fruits which seriously affects oranges in shipment. The trouble is considered due to *Diplodia natalensis*, and the principal source of infection is believed to be in the grove. To reduce this infection the author recommends the pruning out and destruction of dead or unhealthy branches and spraying the trees with fungicides.

Fungi parasitic on the tea plant in northeast India, II, A. C. TUNSTALL (*Indian Tea Assoc., Sci. Dept. Quart. Jour.*, No. 1 (1914), pp. 36-39).—In continuance of previous work (E. S. R., 31, p. 55), the author describes *Rosellinia* root disease of tea bushes. This is said to be easily controlled by removal of all dead wood and jungle, exposure of the collars of the surrounding tea bushes, improvement of drainage, if necessary, and treatment of the upper 6 in. of the affected soil with $\frac{1}{2}$ lb. quicklime per square yard.

Two new Chytridiaceæ, P. HARIOT (*Compt. Rend. Acad. Sci. [Paris]*, 158 (1914), No. 23, pp. 1705-1707).—Descriptions are given of *Cladochytrium mauryi* n. sp., parasitic on leaves of *Colchicum autumnale*, and *Cladochytrium ollivieri* n. sp., which was found on leaves of *Orchis incarnata* and *O. laxiflora*.

Peridermium cedri as a destructive fungus, R. S. TROUP (*Indian Forester*, 40 (1914), No. 10, pp. 469-472, pl. 1).—In a previous publication (E. S. R., 27, p. 654) the author called attention to the occurrence of witches' brooms on Deodar due to the fungus *P. cedri*. Recent observations have shown that the disease is not only more widely spread than has been hitherto supposed, but also that it is one of serious importance. In some plantations at least 80 per cent of the trees were found to be visibly affected.

A contribution to the morphology and life history of *Pestalozzia funerea*, J. J. WENNER (*Phytopathology*, 4 (1914), No. 5, pp. 375-384, pl. 1, figs. 7).—Experiments have been conducted to determine the exact relation of *P. funerea* to various coniferous hosts, inoculation experiments having been made on white pine, Norway spruce, and hemlock.

The experiments have proved that this species is parasitic under certain conditions, the most important of which appears to be the presence of a great amount of moisture in the air. The fungus was able to attack the leaves and stems of all of the host plants used in the experiments, producing a browning of the leaves, and followed in some cases by the appearance of superficial mycelium and the drooping of the young shoots. The shoots finally die and eventually the whole plant is killed.

In addition to the characteristic conidia of the fungus another spore form was found, which is said to correspond to a chlamydospore.

For the control of this disease it is recommended that affected seedlings be destroyed whenever detected, and as a preventive measure that ordinary spraying be adopted.

The expulsion of ascospores from the perithecia of the chestnut blight fungus (*Endothia parasitica*), F. D. HEALD and R. C. WALTON (*Amer. Jour. Bot.*, 1 (1914), No. 10, pp. 499-521, figs. 2).—A report is given of a study of various phases of ascospore expulsion under artificial conditions, the experiments having been carried out through practically the entire year of 1913.

Under artificial conditions in the laboratory spore expulsion was found to be inhibited at low temperatures. The optimum temperature for expulsion was

between 68 and 80° F. These results substantiated the field observations, which showed a cessation of spore expulsion during the winter period. The perithecia were found to have an almost phenomenal power of spore production, spores being expelled from some specimens daily for a period of 168 days, and some perithecia were still active when the test was discontinued. The necks of the perithecia were found to play an important part in the mechanics of spore expulsion. Expulsion was found to occur in a saturated atmosphere, but was more pronounced when specimens were permitted to dry out gradually.

A bibliography is appended.

Plane tree leaf scorch, C. C. BRITTLEBANK (*Jour. Dept. Agr. Victoria*, 12 (1914), No. 6, pp. 335, 336, figs. 2).—The author describes this disease as noted in specimens recently sent from portions of South Australia for examination, cautioning against confusing this trouble (due to *Glæosporium nervisequum*) with a somewhat similar disfigurement due to excessive transpiration caused by hot, dry winds. The perfect stage has not been observed in Victoria, and may possibly not occur in the genial climate of this region. Pollarding, in case of large trees, and spraying with Bordeaux mixture, in case of smaller ones, are recommended, as is also the destruction of all fallen leaves and diseased twigs.

The spotting of prepared plantation rubber, A. SHARPLES (*Dept. Agr. Fed. Malay States Bul.* 19, pp. 31, pls. 4).—This follows up a preliminary account of related studies by Bancroft (*E. S. R.*, 29, p. 451).

It is stated that spottings and discolorations on plantation rubber are due in most cases to common saprophytic fungi possessing proteolytic enzymes, four species receiving more particular attention in this connection, *Penicillium maculans* n. sp., *Chromosporium crustaceum* n. sp., *Trichoderma koningi*, and *Fusarium* sp. The infection is said to follow inoculation in the field, or under bad conditions in drying sheds.

Methods of prevention include sterilization of the latex with formalin and quicker drying of the rubber by the employment of thinner working and the addition of sodium bisulphite. Dilution with water seems to increase the tendency to spotting, and this is also true of the addition of coagulant above the minimum amount necessary for this purpose.

ECONOMIC ZOOLOGY—ENTOMOLOGY.

How to attract birds in northeastern United States, W. L. MCATEE (*U. S. Dept. Agr., Farmers' Bul.* 621 (1914), pp. 15, figs. 11).—This discusses protection, breeding places, water supply, and means of providing a food supply for wild birds about the homestead. Charts are given which show the seasons of fruits attractive to birds and of fruits useful to protect cultivated varieties. It is the first of a series of publications dealing with practicable methods of attracting birds about homes in the various parts of the United States.

Recent investigations on parasitic and other eelworms, G. E. JOHNSON (*Rpt. Brit. Assoc. Adv. Sci.*, 1913, p. 526).—A brief review of recent studies of the nematodes.

Report of the entomologist, 1912–13, T. J. ANDERSON (*Dept. Agr. Brit. East Africa Ann. Rpt.*, 1912–13, pp. 124–131).—A report of observations of the more important pests of the year.

Insect records.—Miscellaneous notes by officers of the division of entomology (*Agr. Jour. Union So. Africa*, 8 (1914), No. 2, pp. 240–244, figs. 8).—Notes on the pumpkin stem borer (*Apomecyna binubila*), which is the source of considerable injury in certain sections of South Africa, and on the bind-weed gall maker (*Nupserha apicalis*) are presented by C. Fuller.

Insect enemies of the ground nut in Senegal, AZÉMARD (*Agr. Colon. [Paris] 1 (1914), No. 10, pp. 106-110; abs. in Rev. Appl. Ent., 2 (1914), Ser. A, No. 9, pp. 549, 550*).—A discussion of the more important enemies of this plant.

Four new proctotrypoid egg parasites of sugar cane insects in Java, A. P. DODD (*Arch. Naturgesch., 80 (1914), Abt. A, No. 5, pp. 162-164*).—*Hadronotus javensis* and two species of *Telenomus* reared from moth eggs on sugar cane and one species of *Telenomus* reared from moth eggs on the leaves of sugar beet are described as new.

[Fleas and mosquitoes in Panama], C. F. MASON (*Rpt. Dept. Health Panama Canal, 1914, Sept., pp. 7, 8*).—Several tests have shown that fleas begin to leave a killed rat as early as 15 seconds after death and that all have left the body a little more than two hours and 15 minutes afterwards.

During September specimens of *Anopheles apicimacula* were collected from several sources. In one locality near habitations they were found breeding with *A. albimanus*, while in another locality they were breeding in water near the site of an abandoned village. Attempts to incriminate *A. apicimacula* by biting three different cases of malaria, each one containing a sufficiency of gametes in the peripheral blood, were made, properly controlled with *A. albimanus*, but neither *A. apicimacula* nor *A. albimanus* could be infected.

A new cotton pest (*Agr. News [Barbados], 13 (1914), No. 326, p. 344*).—This note relates to the attack on cotton in St. Kitts by the Australian cockroach (*Periplaneta australasiæ*), the common household pest in the West Indies. On two estates in St. Kitts much trouble was experienced in getting cotton established in certain fields, the young plants being eaten off as soon as they appeared above ground. The injury is caused by the immature roaches.

A bait of corn meal and Paris green distributed in the field as cotton was just coming up proved quite an efficient means of control.

A chalcid parasitic on thrips (Thysanoptera), R. S. BAGNALL (*Rpt. Brit. Assoc. Adv. Sci., 1913, p. 531*).—The author records the occurrence of *Thripocitenus russelli*, a thrips parasite previously recorded from California by Russell (*E. S. R., 27, p. 262*), in several localities in England.

The influence of temperature, submersion, and burial on the survival of eggs and larvæ of *Cimex lectularius*, A. W. BACOT (*Bul. Ent. Research, 5 (1914), No. 2, pp. 111-117*).—The author finds that the eggs of *C. lectularius* are able to survive exposure to temperatures between 40 and 50° F. for a period of 31 days, and between 28 and 32° for 48 hours. "Periods of from 5 to 8 days at the latter temperature reduce the percentage hatching to 25 per cent and longer exposures, 10 to 15 days, are fatal. Temperatures between 60 to 98° are favorable, but 113° prevents hatching.

"Burial in dry or wet sand, with exposure to temperatures between 45 and 50°, may be survived from 4 days to a week if the eggs are then uncovered and kept at a favorable temperature. Submergence in water at between 60 and 63° for a period of 5 days has no effect on hatching if the eggs are subsequently kept under favorable conditions. They also survive for at least 3 days in water at between 45 and 50°, and for 48 hours when the water in which they are submerged is frozen. Submergence in lime water (saturated solution) for 46 hours is fatal. The eggs survive partial embedding in a wet plaster surface provided that emergence is not interfered with.

"Newly hatched bugs when unfed can survive a temperature of from 28 to 32° for periods up to 18 days. They are also able to withstand chilling, thawing, rechilling and again thawing over shorter periods. When subjected to cold, moist air after a full meal they are liable to a heavy or even total mortality, probably in consequence of humidity rather than cold. Under moderate conditions of temperature, 60 to 65°, they may live for 136 days unfed, and

after a meal, for 9 months. Unfed at a temperature of 75° with humidity between 65 and 70 an average life of 10 days, and an individual survival of up to 21 days, is possible. At 88°, with humidity between 70 to 80, the average life is shortened to 7 days, the longest survival being 11 days. At 96° with humidity at 25 the average life is reduced to 5 days; individuals have survived for 8 days. Exposure to 113° is fatal within a few minutes."

White fly control, 1914, J. R. WATSON (*Florida Sta. Bul. 123 (1914), pp. 3-23, figs. 5*).—This bulletin reports upon the white fly work carried on at the station in 1914 in continuation of that previously noted (E. S. R., 31, p. 751). A summarized account of the citrus white flies and means for their control is included.

The drought caused the 1914 fall brood of white flies to be the largest that Florida has had for several years. It was found that the red and brown fungi can be dried and kept over winter. It is pointed out that the ideal method of controlling the white fly is to spread parasitic fungi during the rainy season and to spray with miscible oil emulsion in spring and fall; that the planting of chinaberry and umbrella trees in citrus communities should be prohibited by law; and that owners of noninfested groves should adopt quarantine measures.

A list of important papers on citrus white fly is appended.

Injury to tropical trees by *Pseudococcus filamentosus*, P. VAYSSIÈRE (*Jour. Agr. Trop., 14 (1914), No. 154, pp. 109-111; abs. in Internat. Inst. Agr. [Rome], Mo. Bul. Agr. Intel. and Plant Diseases, 5 (1914), No. 7, pp. 969, 970*).—This mealy bug, described in 1893 from Hawaii, has since been found in various parts of the world. The branches and leaves of infested trees are covered by masses of white filamentous waxy matter, which sometimes forms sheets joining one branch to another. Severely attacked trees may be killed in a few months.

Petroleum emulsion (6 to 15 per cent) applied as a winter wash appears to be the best insecticide for use in its control. *Cryptolæmus montrouzieri* has been found to be very efficient against this scale in Hawaii.

The relation of variation in the number of larval stages to sex development in the gipsy moth, F. H. MOSHER and R. T. WEBBER (*Jour. Econ. Ent., 7 (1914), No. 5, pp. 368-373*).—Observations which indicated that the larvæ that pupate in the fifth stage produce male moths and those pupating in the sixth stage produce female moths led the authors to conduct experiments which have shown that the variation is quite constant. Of 560 larvæ which transformed into chrysalids 325 pupated in the fifth stage and produced males, while the remaining 235 passed into the sixth stage and developed female pupæ. On several occasions the scarcity of certain foods necessitated the stinting of caterpillars but regardless of this fact the females passed through the additional larval stage. The authors have never found a seventh molt as reported by some observers.

"There can be no doubt but that the gipsy moth is changing or has changed its habits in this country. . . . That the insect itself is less hardy than in the past is a surety and it is far more susceptible to disease."

Contributions to the life history of the lesser peach borer in Ohio, J. L. KING (*Jour. Econ. Ent., 7 (1914), No. 5, pp. 401-403*).—A report of observations, made in the lake regions of northern Ohio during the summer of 1913, which show that *Synanthedon pictipes* has one full brood and a partial second brood in the Lake Erie district. The second brood larvæ emerge as adults during August and the first week in September.

Cutworms, H. T. FERNALD (*Massachusetts Sta. Circ. 43 (1914), pp. 2*).—A revision of Circular 2, previously noted (E. S. R., 19, p. 758).

Progress of verruga work with *Phlebotomus verrucarum*, C. H. T. TOWNSEND (*Jour. Econ. Ent.*, 7 (1914), No. 5, pp. 357-367).—This article reports the details of inoculations of laboratory animals, including *Cebus capuchinus*, *Lepus cuniculus*, *Canis carabicus*, *Cavia cobaya*, and *Canis criollus* by or with *P. verrucarum* in physiological salt solution, at the Verruga Laboratory, at Chosica, Peru, and is in continuation of the investigations previously noted (*E. S. R.*, 31, p. 847).

"Despite repeated and persistent search from July to October, the early stages of the *Phlebotomus* have not yet been discovered. It has thus not been possible to attempt the rearing or breeding of them for infection experiments. While no doubt this could be accomplished with unlimited facilities, it is not at all necessary to the complete demonstration of the transmission, already secured, and its realization is not warranted by the conditions."

A bibliography is appended.

The daffodil fly, *Merodon equestris*, G. STOCKS (In *The Daffodil Year Book. London, 1914: Roy. Hort. Soc.*, pp. 50-59, pls. 2).—This is a report of studies of the life history of *M. equestris* conducted by the author in England. Its life cycle is of two years' duration, the larva carrying on its destructive work from July of one year to February of the second following year, approximately 19 months being passed by the immature stages in the bulb.

Further notes on the breeding of the tachinid fly, parasitic on the cane beetle borer, J. F. ILLINGWORTH (*Jour. Econ. Ent.*, 7 (1914), No. 5, pp. 390-398, pl. 1).—In this paper the author describes the means by which he successfully introduced a tachinid parasite, *Ceromasia sphenophori*, of (*Sphenophorus*) *Rhabdocnemis obscurus* from Hawaii into Fiji. Biological notes are included. As many as 570 fully developed eggs have been found by Muir^a in the uterus of a single female, and it is stated that the number of young possible for a fly to produce is upwards of 1,000. The eggs have been found by Muir to hatch while still in the uterus and the larvæ to be deposited.

A note on *Rhagoletis pomonella* in blueberries, W. C. WOODS (*Jour. Econ. Ent.*, 7 (1914), No. 5, pp. 398-400).—The author records the infestation of the fruit of three species of blueberries, namely, *Vaccinium pennsylvanicum*, *V. canadense*, and *V. vacillans*, in Washington County, Me., by the apple maggot. When the maggots are small an infested berry can not be distinguished by sight from a sound one, but usually when they have attained a fair size the fruit becomes very much shriveled and shrunken and the pulp red and stringy. In this county an area of 250,000 acres has grown up almost entirely to blueberries from which the berries are gathered and sold to canneries.

[Report and minutes of evidence of the Sleeping Sickness Committee] (*Sleeping Sickness Com. [Gt. Brit.], Rpt. 1914*, pp. 26; *Minutes of Evidence*, pp. 330).—These contain much data relating to the biology of tsetse flies and their rôle in the transmission of trypanosomes.

The bean fly (*Agromyza phaseoli*), A. RUTHERFORD (*Trop. Agr. [Ceylon]*, 42 (1914), No. 5, pp. 411-413).—It is stated that the bean crop in Ceylon is often a complete failure due to the attack of this pest.

The wheat bulb fly (*Hylemyia coarctata*), B. WAHL (*Monatsh. Landw.*, 7 (1914), No. 3-4, pp. 82-85, figs. 2; *Wiener Landw. Ztg.*, 64 (1914), No. 65, pp. 633, 634, figs. 2; *abs. in Rev. Appl. Ent.*, 2 (1914), Ser. A, No. 7, pp. 475, 476).—This fly, known as the "Getreideblumenfliege," is a source of injury to wheat, rye, and more rarely barley, in Austria. The larvæ, like that of the frit fly with which it appears to have been confused, eats out the heart of the young plant, causing it to wither. One larva may wander from one plant to another,

^a Hawaii. Planters Rec., 1909, pp. 256-261; 1910, pp. 186-200.

attacking as many as six, so that not infrequently a whole field may be destroyed. Its life history and habits and remedial measures are discussed.

A contribution to a knowledge of the belladonna leaf miner (*Pegomya hyoscyami*), its life history and biology, A. E. CAMERON (*Ann. Appl. Biol.*, 1 (1914), No. 1, pp. 43-76, pls. 3, figs. 4).—This dipteran, which occurs throughout Europe, the United States, and Canada, has often been described under different names, partly because of its having been reared from a fairly wide range of food plants. In addition to belladonna it attacks mangolds, beets, and henbane.

The leaves which it attacks quickly wither during dry weather. "The number of the larvæ in one leaf varies with the size of the latter and, roughly speaking, directly as the size. The ravages are periodic and often quite localized, resulting in diminished yields of the products of the different crops attacked. The top shoots are most heavily infested early in the season, but later the radical leaves are most attacked.

"Hibernation occurs in the pupal condition about 2 in. below the surface of the soil near the food plants. The number of broods varies. There are at least three in [this] latitude [the north of England]. The broods are not separated sharply off from each other. There is a good deal of overlapping so that all stages occur in the field during the greater part of the season.

"The eggs are deposited superficially on the back of the leaf in groups consisting of parallel series varying in number. The incubation period is about 5 days. The larvæ feed uninterruptedly and complete their metamorphosis in 10 days under the most favorable circumstances. The larvæ of the first two broods sometimes pupate in the leaf, generally making their way to the margin to do so. The pupal period of the first two broods is about 17 days. The average period for one complete life cycle is about 36 days.

"Two closely related species, *P. bicolor* and *P. nigritarsis*, attack common weeds such as dock. Their life histories are, in all details, almost similar to that of *P. hyoscyami*. Structurally there are some interesting differences, especially in the larval stages. . . .

"Natural control of the pest is secured by the parasitism of two species of braconids on one or both of which a proctotrypid is probably hyperparasitic. The degree of parasitism ascends to a climax at the end of August and beginning of September, and then suddenly diminishes. Frequent hand picking of attacked leaves and their destruction provides a ready and effective means of killing the maggot and unhatched eggs. This method is only practicable where the crop is a small one. . . . Paraffin emulsion is not so effective in killing the maggot as this same emulsion with nicotin added."

A bibliography of 37 titles is appended.

An apterous *Drosophila* and its genetic behavior, C. W. METZ (*Amer. Nat.*, 43 (1914), No. 575, pp. 675-692, fig. 1).—This paper deals with an apterous form of the pomace fly (*Drosophila ampelophila*) which had been reared from cultures in the laboratory. The study of the heredity of this form is said to have been difficult because of its almost complete (apparent) sterility.

Indian forest insects of economic importance: Coleoptera, E. P. STEBBING (*London, 1914*, pp. XVI+648, pls. 64, figs. 401).—A manual of information on the Coleoptera injurious or beneficial to forestry in India.

The reproduction and fecundity of the elm leaf beetle (*Galerucella luteola*), LÉCAILLON (*Compt. Rend. Acad. Sci. [Paris]*, 159 (1914), No. 1, pp. 116-119).—In the vicinity of Toulouse the elm leaf beetle continues to reproduce from early May to the first part of July. Females kept under observation have deposited as high as 513 eggs. In nature the females do not deposit all the eggs

on the same leaf but pass from one leaf to another and frequently fly from tree to tree. Larvæ from the egg clusters disperse to different leaves. Adults, both male and female, feed continuously throughout the period of reproduction.

The mango weevil, A. RUTHERFORD (*Trop. Agr. [Ceylon]*, 42 (1914), No. 5, pp. 410, 411; *abs. in Rev. Appl. Ent.*, 2 (1914), Ser. A, No. 9, pp. 540, 541).—*Cryptorhynchus mangiferæ* is said to be widely distributed in India, Ceylon, the Philippines, Madagascar, South Africa, and Hawaii. It is stated that in Labuan, Straits Settlements, where this species seems to be spreading, only about 10 per cent of the mangoes are edible, probably because of this species.

On some Curculionidæ living in bamboo stems, A. DA COSTA LIMA (*Mem. Inst. Oswaldo Cruz*, 6 (1914), No. 2, pp. 117–123, pls. 2).—A small cultivated bamboo, known in Brazil as Indian cane, frequently suffers from the attacks of *Erethistes lateralis*. As a result the stem breaks at the place of infestation and drops to the ground. Its egg is parasitized by a chalcidid, here described as *Prodecatoma cruzi* n. sp. Indian cane is also attacked by the tenebrionid *Acropteron rufipes*, which feeds on its shoots, and by a lamellicorn beetle (*Bolax* sp.?), which consumes the leaves.

The scent producing organ of the honeybee, N. E. MCINDOO (*Proc. Acad. Nat. Sci. Phila.*, 66 (1914), pt. 2, pp. 542–555, pls. 2, fig. 1).—This article deals entirely with the morphology of the scent-producing organ, the work relating to the odors produced by it being reserved for a separate paper.

Beekeeping for the Oregon farmer, H. F. WILSON (*Oreg. Agr. Col. Bul.* 168 (1914), pp. 31, figs. 14).—This furnishes practical information for those engaged in beekeeping.

Notes on the life history and ecology of *Tiphia inornata*, G. N. WOLCOTT (*Jour. Econ. Ent.*, 7 (1914), No. 5, pp. 382–389).—The scoliid here discussed is the most important parasite of *Lachnosterna* larvæ in this country. The observations reported were made in central and northern Illinois during 1912–13 while the author was engaged in collecting the parasite for introduction into the sugar cane fields of Porto Rico.

There appear to be two generations each year, the species hibernating either as a larva, pupa, or adult inside the cocoon. Under favorable circumstances it greatly reduces the numbers of grubs and in some cases practically exterminates *Lachnosterna* from limited areas.

Of the several checks to its increase a fungus, thought to be a species of *Isaria*, is said to be the most important.

Preliminary observations upon the life histories of *Zenillia pexops* and *Hypamblys albopictus*, R. A. WARDLE (*Jour. Econ. Biol.*, 9 (1914), No. 3, pp. 85–104, pls. 3, fig. 1).—This article relates to two parasites of the large larch sawfly (*Nematus erichsonii*) which have not previously been recorded.

It is stated that the decline in numbers of the parasite *Mesoleius tenthredinis*, formerly quite abundant, was one of the features of the investigation of the large larch sawfly in 1913. This decline is said to have been accompanied by the appearance in comparatively large numbers of the two previously unrecorded parasites that are here considered, namely, "*H. albopictus*, an ichneumon closely related to *Mesoleius*, and having corresponding life history stages, though emerging possibly a few days earlier (*Hypamblys* hibernates as a first stage larva), and *Z. pexops*, a tachinid fly, probably the same parasite that has previously been recorded at various times since 1910 as *Exorista crinita*, *E. alacris*, and *E. dubia*. *Zenillia* is exceptional for a tachinid in hibernating as a final stage larva. It pupates and forms its puparium within the cocoon of the sawfly, and emerges about the same time as the host. As *Zenillia* appears to predominate at the expense of the ichneumon parasites, it is important that

future work should bear upon the question of the respective values of the various parasites in the control of the sawfly."

An unrecorded parasite of *Toxoptera graminum*, F. M. WEBSTER (*Jour. Econ. Ent.*, 7 (1914), No. 5, pp. 403, 404).—The author calls attention to the fact that by mistake *Eupachylomma rileyi*, reared from the spring grain-aphis, is not recorded as a parasite of that pest in the bulletin previously noted (E. S. R., 27, p. 859).

The house centipede, C. L. MARLATT (*U. S. Dept. Agr., Farmers' Bul.* 627 (1914), pp. 4, figs. 2).—This is a reprint of Bureau of Entomology Circular 48, previously noted (E. S. R., 14, p. 374.)

Injury to truck crops by springtails (*Smynturus* sp.), D. E. FINK (*Jour. Econ. Ent.*, 7 (1914), No. 5, pp. 400, 401, pl. 1).—The author reports upon observations of injury by springtails (*Smynturus* sp.) to lettuce, spinach, and seedling cucumbers.

Two new Sarcosporidia, H. CRAWLEY (*Proc. Acad. Nat. Sci. Phila.*, 66 (1914), pt. 1, pp. 214-218, fig. 1).—*Sarcocystis leporum*, a parasite of rabbits, and *S. setophagæ*, a parasite of the American redstart (*Setophaga ruticilla*), are described as new.

Preliminary list of the Acari occurring on the brown rat (*Mus norvegicus*) in Great Britain, with the description of a new species (*Hæmogamasus oudemansi*), S. HIRST (*Bul. Ent. Research*, 5 (1914), No. 2, pp. 119-124, pls. 3, figs. 3).—Twelve species are listed as occurring on wild specimens of the brown rat. Only three, namely, *Laelaps echidninus*, *Notoedres muris*, and *Myobia ensifera*, can be regarded with certainty as practically restricted to *M. norvegicus*, although *H. oudemansi*, here described as new, has thus far been found only on this host.

The evolution of *Sarcocystis muris* in the intestinal cells of the mouse, H. CRAWLEY (*Proc. Acad. Nat. Sci. Phila.*, 66 (1914), pt. 2, pp. 432-436, pl. 1).—A contribution to the knowledge of the biology of this parasite.

Further research on Spiroptera cancer in rats, J. FIBIGER (*Hospitaltid. [Copenhagen]*, 57 (1914), Nos. 34, pp. 1049-1080; 35, pp. 1081-1112; abs. in *Jour. Amer. Med. Assoc.*, 63 (1914), Nos. 14, p. 1244; 16, p. 1432).—In a further study of this subject (E. S. R., 30, p. 279) the author finds that the parasite which he has discovered in cancer in rats is a new species of Spiroptera. In Denmark this parasite has been found only in *Mus decumanus* among numerous rats infesting three sugar warehouses. The finding of the parasites in a large proportion of the rats and in 77 of 115 cockroaches, which seem to serve as intermediate hosts, from West Indian ports led the author to conclude that the parasite is a tropical species.

The author's total material includes 19 cancers developing in the stomach after feeding the rats with roaches infected with Spiroptera. This he regards as indicating that under certain conditions one-half or four-fifths of the animals infected develop cancer and that no individual predisposition is necessary for this.

Naphthalin as an insecticide (*Agr. News [Barbados]*, 13 (1914), No. 327, p. 360).—A brief summarized account.

FOODS—HUMAN NUTRITION.

The source, chemistry, and use of food products, E. H. S. BAILEY ([*Philadelphia*], 1914, pp. XIV+517, figs. 75).—This book, which is designed as a text-book for college and high school students in home economics, deals with the more important food products with reference to their source, methods of

preparation for the market, their packing, preservation and shipment, their composition, food and dietetic value, and their use by people of various countries. The food products treated are cereals and cereal products, sugar and other saccharin substances, vegetables, fruits, berries, animal and vegetable fats and oils, nuts and nut products, meat and meat products, fish, eggs and their products, milk and dairy products, spices, and beverages, both alcoholic and nonintoxicating.

Meat purchasing a science, A. J. CUFF ([*Portland, Oreg.*], 1914, pp. 64, pls. 6).—This little book, which is designed especially for the use of housekeepers, includes a description of the different cuts of beef, pork, veal, and lamb, and a discussion of the best way in which each cut may be utilized in the home. Several suggestions regarding selecting and cooking meat, together with a few recipes, are also given.

The dearness of meat, F. ORT ([*Het Dure Vleesch. [Utrecht]*, 1913, pp. 16).—A summary and digest of data, in which the author expresses the opinion that although protein is indispensable for maintenance and growth, meat in the diet may be to a great extent supplemented by other sources of protein. Considerable emphasis is laid upon the necessity for stimulating the appetite through the preparation of appetizing meat substitutes.

The changes in the character of fats during the process of cooking, HELEN MASTERS and H. L. SMITH (*Analyst*, 39 (1914), No. 461, pp. 347-350).—From a study of the analytical constants of cotton-seed oil and butter fat, both before and after being cooked with flour, the authors conclude that very little change takes place in the fats during cooking except in the case of very thin or considerably overcooked pastries. A slight oxidation of the fats occurred. A decrease in the iodine value and an increase in the refractive index and acidity were also noted.

Changes taking place during baking—chemical composition of bread, H. KALNING and A. SCHLEIMER (*Ztschr. Gesam. Getreidew.*, 6 (1914), No. 7, pp. 137-143).—The authors report the results of analyses of a large number of samples of wheat and rye bread, which tend to show that the bread contains a smaller percentage of starch and a greater percentage of sugar than were originally present in the flour. The principal difference between the crumb and crust consists of a change in carbohydrates. At high temperatures the starch in the crust is more completely changed to dextrin.

The effect of bread wrapping on the chemical composition of the loaf, H. E. BARNARD and H. E. BISHOP (*Amer. Food Jour.*, 9 (1914), No. 8, pp. 367-376, figs. 14).—The authors studied the composition of wrapped and unwrapped bread.

To establish a standard for the composition of freshly baked bread a number of loaves of the regular brands from the daily baking of the local bakeries were analyzed within three or four hours after baking. Analyses were also secured of loaves from the same baking, some having remained unwrapped for periods of one to six days, and others having been wrapped for periods of one to five days. Determinations were made of moisture, ash, protein, total solids, soluble solids, starch, soluble carbohydrates, acidity, and lactic acid. The following varieties were included in the study—straight dough pan bread, straight dough rye bread, sponge dough rye bread, straight dough Vienna hearth bread, and Bohemian sponge rye bread. The technique is described in detail, and full analytical data are shown. The following conclusions are drawn:

The wrapping of bread in either semiporous waxed or paraffin paper prevents the escape of moisture and tends to preserve the colloidal condition and physico-chemical equilibrium, the destruction of which has been shown by other workers to produce staleness.

These experiments do not support the belief that the moisture of the crumb is imparted to the crust, causing it to lose its crispness. The analytical data show conclusively that the loss of moisture by the crumb is practically always accompanied by a corresponding loss of moisture by the crust. In the case of ordinary breads, lactic acid acidity does not develop within six days of baking, either in the unwrapped or in the wrapped loaves.

"The use of semiporous and paraffin wrappers does not injure the quality of the loaf after the third day. Up to that time the keeping quality both as to condition of crumb, flavor, and odor is enhanced by the use of the wrappers. Unwrapped bread loses its freshness after the first day. But little difference is observed in the condition of the straight dough pan bread, straight dough rye, sponge dough rye bread, and straight dough Vienna hearth bread. Bohemian rye sponge dough wrapped or unwrapped bread is not of satisfactory quality on and after the third day."

This paper was followed by a discussion.

A report of a chemical and bacteriological study of wrapped bread, B. R. JACOBS, J. A. LECLERC, and MAUD L. MASON (*Amer. Jour. Pub. Health*, 4 (1914), No. 9, pp. 721-732).—In this investigation the following aspects of the question of wrapped bread were studied: The kind of paper best adapted to wrapping bread; the lapse of time after baking before bread should be wrapped to secure the best results; bacteriological examination of both wrapped and unwrapped bread; and the relative weights of wrapped and unwrapped bread.

The experimental procedure as carried out in the bakeries was as follows: The rate of cooling of the freshly baked loaves was determined by means of thermometers inserted in them immediately after removal from the oven. One loaf from each baking was wrapped in sterile paper and taken at once to the laboratory for bacteriological examination. At intervals of one hour for five hours, three of the remaining loaves in each experimental baking were weighed, wrapped, and set aside for examination. Some of the loaves were also allowed to remain unwrapped in the bakery. On the next day both the wrapped and unwrapped bread was taken to the laboratory by one of the regular delivery wagons of the bakery and allowed to remain at room temperature. Some loaves were exposed to the air and others kept in a closed show case, weights and samples being taken at intervals.

Bread wrapped in unwaxed paper lost more moisture than that in waxed paper, and bread in paper waxed on both sides lost less moisture than that wrapped in paper waxed on only one side. The firmness of the crust of all the bread was directly proportional to the loss of moisture. It is therefore probable that breads whose crusts are to be kept firm and dry, such as Vienna and French breads, may be kept in the best condition by wrapping in porous rather than in waxed paper. In the case of ordinary bread none of the papers used showed any detrimental results and no objectionable features developed, so far as could be determined by odor or taste, in wrapped bread even at the end of 114 days.

In the bacteriological examination samples were taken from the outside of the loaf only. The results of this examination showed that the crust of the loaf as it leaves the oven is practically sterile. If exposed unwrapped in the bakery it may collect a large number of bacteria, but in 0.1 gm. samples of such bread examined no organisms of the *Bacterium coli* type were found. Bread which has been cooled for only one hour before being wrapped retained sufficient heat and moisture to favor the growth of organisms, especially when waxed paper was used for wrapping. The lapse of time before which bread should be wrapped can be fixed approximately at three hours, since the bread reaches the

temperature of the room at this period. It should be wrapped as soon as sufficiently cooled, in order to minimize the danger of contamination with bacteria and molds.

In addition to the samples of freshly baked bread taken from the bakeries, 27 samples of wrapped and 29 of unwrapped bread were purchased in a number of retail stores for bacteriological examination.

It was found that 62 per cent of the samples of unwrapped bread showed organisms of the *B. coli* type in 0.1 gm. samples, as compared with only 7 per cent of the wrapped breads. These figures are illustrative of the conditions in which wrapped and unwrapped bread are received in the home.

Changes in bread on aging, M. P. NEUMANN (*Ztschr. Gesam. Getreidew.*, 6 (1914), No. 6, pp. 119-122).—On aging the crust loses its elasticity and dry appearance and becomes somewhat pulpy and tough. The crumb loses its plasticity, moisture, and tenderness and becomes dry, solid, and hard. The total volume of the loaf becomes less, the loss in some instances amounting to as much as 25 per cent. This is proportional to the thickness and tenacity of the crust and to the water loss. The highest percentages of water absorption by the crumb were found to be as follows: Fresh graham bread, 219; stale graham bread, 170; fresh white bread, 289; and stale white bread, 153. This capacity for absorbing water can be restored to the stale bread by heating for a short time.

Ice cream standards, W. B. BARNEY (*Amer. Food Jour.*, 9 (1914), No. 8, pp. 431, 432).—The necessity for such a standard is emphasized and various aspects of the question are discussed from the point of view of the consumer and the manufacturer.

Ice cream soda and soft drinks, W. S. MATTHEWS (*Ill. State Food Com. Bul.* 32 (1914), pp. 12).—This bulletin gives detailed information regarding the selection, care, and storage of the sirups, milk, cream, ice cream, and eggs used in connection with soda fountains.

Information is also given regarding the care and cleaning of all equipment. The necessity for thoroughly washing all glasses is strongly emphasized and rules for employees are given.

Egg albumin in baking powder, E. F. LADD (*Amer. Food Jour.*, 9 (1914), No. 8, pp. 388, 389).—In the opinion of the author no advantage results from the use of albumin in baking powder as the gluten of the flour furnishes the albuminous material (*E. S. R.*, 29, p. 866).

Tomato pulp, W. D. BIGELOW and F. F. FITZGERALD (*Nat. Canners Assoc. Bul.* 3 (1914), pp. 14).—A digest of data which leads to the suggestion of standards for the manufacture of catsup and for canning pulp. These suggestions are of special value to the manufacturer of these products.

Swells and springers, W. D. BIGELOW (*Nat. Canners Assoc. Bul.* 2 (1914), pp. 16).—These are defined by the author as imperfect canned goods due to faults in methods of manufacture. It is pointed out that swells are the result of decomposition and that such goods should never be used for food. Springers are the result of overfilled or insufficient exhaust and in some instances are due to the action of strongly acid foods upon the can with the generation of hydrogen. Springers resulting from overfilled or insufficient exhaust should be resealed and resterilized before being used as food. The paper is followed by a discussion.

Cause of variation in weight or measure of food products, L. M. TOLMAN and W. E. HILLYER (*Amer. Food Jour.*, 9 (1914), No. 8, pp. 407-416, figs. 7).—Data are given showing the variation in the weight of packages, both those which are put up by hand and those which are machine packed, likewise the

variation in the change in weight with varying degrees of humidity. The paper is followed by a discussion.

[Food and drug inspection], H. E. BARNARD ET AL. (*Ind. Bd. Health, Ann. Rpt. Chem. Div.*, 8 (1913), pp. 1-131, figs. 5).—The work carried out under the Indiana state food laws during the year ended September 30, 1913 is reviewed. This included the examination of 1,257 samples of food, of which 546 were found to be illegal.

Analytical data are given regarding the samples of food products examined, as are also the results of the inspection of places where food is manufactured and sold as well as the detailed inspection of the sanitary condition of a large number of canning factories in various parts of the State.

[Food, drug, and water inspection and analysis], G. B. TAYLOR (*Bien. Rpt. La. Bd. Health*, 1912-13, pp. 157-227).—The results are reported of the analysis of 1,684 samples, which included food materials of various sorts, milk, dairy products, ice cream, drugs, and samples of water from public supplies such as schools and railroad trains. A report of the sanitary inspection of New Orleans dairies, with a summary of the improvements secured, is also given.

[Food and drug inspection and analysis], W. G. TICE (*Ann. Rpt. Bd. Health N. J.*, 37 (1913), pp. 276-372, pls. 4).—The work accomplished under the New Jersey food laws during the year ended October 31, 1913, is reviewed. This included the examination of 6,260 samples of food and drugs, of which 5,488 were found to be above standard. Sanitary inspections were also made of slaughterhouses, cold-storage warehouses, and canning factories.

Among the special investigations reported are the bacteriological examination of water cress grown on the banks of a polluted stream, which was found to be contaminated and unsafe as a food; the bacteriological examination of a number of cans of frozen eggs held in cold storage; and a sanitary survey of the shellfish industry of the State. This latter included the examination of the water from which the shellfish were taken and the conditions under which they were gathered, packed, and shipped. Rules are given which regulate the preparation of soft clams for market.

[Food and drug inspection and analysis] (*Bul. Tenn. Food and Drugs Dept.*, n. ser., 1 (1914), No. 1, pp. 40).—This bulletin contains the annual report of the commissioner, L. P. Brown, and data regarding the examination of miscellaneous food products and similar materials. The text of the state pure food and drug laws and of the state sanitary food law is also given.

Municipal ordinance, rules, and regulations pertaining to public health (*Pub. Health Rpts. [U. S.]*, Reprint 199 (1912-13), pp. 570).—In this compilation are included the regulations, adopted during 1912 by the towns and cities of the United States, having a population of over 10,000, for controlling the sanitary condition of laundries and lodging houses, the production, care, and sale of foodstuffs including milk and meat and their products, and the sanitation of bakeries, hotels, restaurants, and boarding houses. Regulations are also included regarding common drinking cups and towels, the sale of secondhand clothing and household goods, housing, and the care of premises.

Regulation of food supplied hotels, with particular reference to sanitary conditions involved in its preparation, G. G. FRARY (*Amer. Food Jour.*, 9 (1914), No. 8, pp. 365-367, fig. 1).—This article emphasizes the importance of the inspection of hotels and other places where food is served. Attention is called to the importance of the health of the employees and the need not only for scrupulous cleanliness of surroundings and utensils but also for the provision of proper sanitary conveniences for the employees.

The paper is followed by a discussion.

Investigations of the presence of bacteria in places where meat is slaughtered and sold, with special reference to the paratyphoid-Gaertner group, E. HOFFENREICH (*Tierärztl. Zentbl.*, 37 (1914), No. 22, pp. 337-346).—Bacteriological examinations of 249 samples of meat from a typical slaughterhouse gave no indication of the presence of organisms of this type. Failure to isolate these organisms at any time during three months tends to show, in the opinion of the author, that their distribution is not so general as has been supposed.

Manual of Creole cooking, J. E. TRIAY (*Manual del Cocinero Criollo. Havana, 1914*, pp. 319).—A compilation of recipes for the preparation of Creole dishes and such Spanish, French, Italian, and English dishes as are generally served in Cuba.

History and present status of the school feeding movement, LOUISE S. BRYANT (*4. Internat. Cong. School Hyg. Buffalo, N. Y., Trans.*, 5 (1913), pp. 280-284).—A sketch of the rise of the school feeding movement in Germany, England, France, Italy, and the United States, together with a brief statement of its present status in various countries and its probable development as an ally to the general science of nutrition.

Educational and social possibilities of school luncheons, MARY E. L. SMALL (*4. Internat. Cong. School Hyg. Buffalo, N. Y., Trans.*, 5 (1913), pp. 317-319).—This paper emphasizes the moral and esthetic as well as the physiological advantage of school lunches served under the supervision of women of refinement.

Hot lunches in rural schools, MARY L. BULL (*4. Internat. Cong. School Hyg. Buffalo, N. Y., Trans.*, 5 (1913), pp. 320-323).—This is a brief survey of the results achieved by the movement for serving hot noon lunches in small rural schools in Minnesota.

Relation of menus to standard dietaries, MABEL H. KITTREDGE (*4. Internat. Cong. School Hyg. Buffalo, N. Y., Trans.*, 5 (1913), pp. 309-316).—The experience of the New York School Lunch Committee is described, first in serving table d'hôte lunches at from 3 to 5 cts. a child and later in developing the à la carte service. The menus used in schools for children of Italian, Jewish, and American extraction are discussed along with their energy value and cost.

Special studies in the correlation of malnutrition and disease, J. AULDE (*4. Internat. Cong. School Hyg. Buffalo, N. Y., Trans.*, 5 (1913), pp. 273-279).—In the author's opinion much dietetic work with school children is deficient in that it fails to take accurate account of the various mineral matters needed and supplied. Special emphasis is placed on the deleterious results following calcium depletion in the child's organism.

The nutrition of anemic and tuberculous children, E. A. LOCKE (*4. Internat. Cong. School Hyg. Buffalo, N. Y., Trans.*, 5 (1913), pp. 285-297).—This discussion includes a review of the better known dietary standards for children of different ages and body weights, and of the author's work at the Franklin Park (Boston) Hospital School for Tuberculosis Children.

The Alaskan Eskimo, J. A. WATKINS (*Amer. Jour. Pub. Health*, 4 (1914), No. 8, pp. 643-648, figs. 5).—This article contains data regarding the diet and general living conditions of the Eskimos inhabiting islands off the coast of Alaska.

The diet of sailors, MARKL (*Arch. Schiffs u. Tropen Hyg.*, 18 (1914), No. 17, pp. 583-605).—This article includes a discussion of the history of navigation and information regarding the solution of problems of drinking water supply, prevention of scurvy, etc. The rations supplied to sailors in the merchant marine of various countries are considered somewhat at length and sample menus are given. These diets are often unbalanced and generally have an excessive energy value. The need for experimental work in this field is emphasized.

Newer points of view regarding the part played by different food substances in nutrition, L. B. MENDEL (*Jour. Amer. Med. Assoc.*, 63 (1914), No. 10, pp. 819-822).—A summary and digest of data regarding the latest views of metabolism of nitrogenous food and the importance of the vitamins, most of which has been noted from other publications by the author (*E. S. R.*, 31, p. 69).

The specific dynamic action of the foodstuffs, G. LUSK (*Jour. Amer. Med. Assoc.*, 63 (1914), No. 10, pp. 824-827).—In this article the author reviews the work of others and summarizes the results of 250 experiments carried out by himself with dogs, in which was investigated the cause of the increased heat production after the ingestion of food. He draws the following conclusion: "Living cells metabolize carbohydrates and fats in increased quantity when these are present in large amounts in the surrounding fluid, and . . . they are also stimulated to a higher heat production during the metabolism of certain amino acids to an extent which is entirely out of proportion to the energy value of those amino acids, and which may indeed be independent of their energy value."

Intermediary protein metabolism, O. FOLIN (*Jour. Amer. Med. Assoc.*, 63 (1914), No. 10, pp. 823, 824).—A review and criticism of the large amount of experimental data contributed to this subject by the author and other workers, in which the following facts are emphasized:

In the stomach the greater part of the protein is dissolved and converted into albumoses and peptones. In the intestines these dissolved products, together with any remaining undissolved proteins, are split up into amino acids, which are absorbed as soon as formed and transported by the blood to all parts of the body. Each tissue rebuilds itself from the amino acids received from the blood and such of these bodies as are not needed are converted into urea and carbonaceous remainders.

Basal metabolism and creatinin elimination, W. W. PALMER, J. H. MEANS and J. L. GAMBLE (*Jour. Biol. Chem.*, 19 (1914), No. 2, pp. 239-244).—Observations of the relation between creatinin elimination and basal metabolism were made upon a number of men and women at least 12 hours after ingestion of food and in a state of complete muscular rest. The subjects were given a diet containing no meat, fish, or meat soups for a period of three days. According to the authors, no definite conclusions can be drawn from the results, but further experiments are in progress.

Metabolic changes in muscular tissue.—I, The fate of amino-acid mixtures, S. A. MATTHEWS and C. F. NELSON (*Jour. Biol. Chem.*, 19 (1914), No. 2, pp. 229-234).—The authors review the work of others and present the results of a series of experiments in which amino acids were administered to dogs in such a way as to insure slow absorption and intimate contact with the tissues, at the same time avoiding contact with the cells of any organ of special function which might influence their metabolism.

The following conclusions are drawn:

"We have brought forward evidence of a positive nature showing that when amino-acid mixtures are injected into muscular tissue, these compounds are broken down and appear in the urine largely as ammonia and urea. A method for determining the exact character of metabolic changes taking place in muscular tissue has been described. We are at present working on the fate of individual amino acids and other compounds of a protein nature when injected into muscular tissue in the manner above described."

The rôle of carbohydrate in nutrition, E. P. CATHCART (*Brit. Med. Jour.*, No. 2803 (1914), pp. 503, 504).—Experiments were carried out, with one man, to determine the amount of carbohydrate required to check the increased protein

catabolism resulting from an excessive fat diet. The diet in these experiments contained no protein and consisted either of pure olive oil or olive oil plus pure anhydrous glucose. It was impossible to continue the experiment beyond three days, owing to the objectionable nature of the diet.

The addition of small amounts of sugar to the basal oil ration resulted in a decrease in the output of total nitrogen. A meal rich in carbohydrate but not poor in protein, given on the fourth day, resulted in a fall in the output of total nitrogen and a decrease in the degree of acidosis.

In the opinion of the author, protein, carbohydrate, and fat are replaceable only to a limited extent, and "in isodynamic or any other amount they are not isotamentic—that is, equal sparing."

Chemical studies of growth, C. FUNK and A. B. MACALLUM (*Hoppe-Seyler's Ztschr. Physiol. Chem.*, 92 (1914), No. 1, pp. 13–20, pl. 1).—The authors review the work by Osborne and Mendel (*E. S. R.*, 30, p. 560), in which they were able to support growth by the addition of rectified butter containing no nitrogen. From similar experiments carried out by themselves the authors maintain that such rectified butter does contain small amounts of nitrogen and that it is impossible to free butter fat from nitrogen entirely by pipetting off the clear fat from centrifuged butter.

A number of other factors which may influence growth and maintenance are discussed.

Observations on the isolation of the substance in butter fat which exerts a stimulating influence on growth, E. V. MCCOLLUM and MARGUERITE DAVIS (*Jour. Biol. Chem.*, 19 (1914), No. 2, pp. 245–259, figs. 2).—The authors report data regarding the maintenance and growth of laboratory animals (rats) when fed upon fat-free diets alone and fat-free diets to which was added olive oil which had been shaken with a soap solution prepared by complete saponification of butter fat with potassium hydroxid in the absence of water. By the addition of this modified olive oil the authors were enabled to induce the resumption of growth in rats which had ceased to grow upon a fat-free diet. The experiments of these authors with butter fat tend to strengthen the conclusion drawn by Funk and Macallum (see above), regarding the difficulty of completely freeing butter fat from nitrogen.

Contribution to the study of the origin of fatigue, G. VIALE (*Atti R. Accad. Lincei, Rend. Cl. Sci. Fis., Mat. e Nat.*, 5. ser., 22 (1913), I, No. 4, pp. 263–256; *abs. in Zentbl. Biochem. u. Biophys.*, 16 (1914), No. 22, p. 838).—A summary of experimental data to show the relationship between the secretion of salt and water and work.

The author concludes that one of the causes of fatigue may be the increase in the water supply, which results in a disturbance of heat regulation and an increase of toxins in the blood. While fatigue on high mountains accompanies the using up of hemoglobin in the circulating blood stream, this does not affect the thinning of the blood but, on the contrary, takes place as a result of a hyperemia in some of the central organs, namely, the lungs.

ANIMAL PRODUCTION.

Recent studies in animal pigmentation, R. C. SCHIEDT (*Science, n. ser.*, 40 (1914), No. 1025, pp. 279–283).—Reviewing the work of other investigators and summarizing the results of his own studies, principally with the oyster, the author concludes that "animal pigmentation is probably a protein formation due to an enzym which is circulating in the blood and present in the nucleoplasm of all secreting cells. This, of course, could only be proved by chemical analysis. In some cases the leucocytes are transformed into specific chromatophores or

melanoblasts, capable of amœboid motion; in others the deposition of pigment has become a hereditary factor, as, e. g., in the choroid coat of the eye or the inkbag of the squid; in still other cases pigmentation is stimulated into action by internal metabolic processes as well as by external conditions of light, temperature and atmospheric gases."

Hairs and hair pigments, H. ONSLOW (*Knowledge*, 37 (1914), No. 550, pp. 161-165, figs. 6).—This article deals with the physiological character of hair and hair pigments, in which it is shown that the color of hair depends upon the color and form of the pigment (i. e., whether it is diffused or deposited in granules), and upon the vacuoles.

Biological searchlight on race-horse breeding.—VII, The heredity of coat color. VIII, The heredity of gray coat color, J. B. ROBERTSON (*Bloodstock Breeders' Rev.*, 3 (1914), Nos. 1, pp. 16-31; 2, pp. 91-107, fig. 1).—After a discussion of the structure of skin and hair and the biochemistry of pigmentation, the author takes up a definition of the various coat colors including chestnut, bay, brown, black, grays and roans, dun, and white or albino, the three basic pigments being black, chocolate, and yellow.

In considering the behavior of the various colors in heredity it is shown that while the relationship of black to brown and bay, and of brown to bay is not definitely settled, the relationship of these three colors to the three varieties of chestnut is exceedingly simple, for all behave as dominants over chestnut, irrespective of its hue. In practice black, brown, and bay both collectively and severally behave in heredity as alternative characters to chestnut. In proof that chestnuts breed true the author cites the studies made by Bunsow and others, and concludes "no one has been able to bring forward an authentic case of two chestnut thoroughbreds producing aught but chestnut offspring, and there can be not the slightest doubt that chestnuts invariably breed true—and this notwithstanding that their bay, brown, and black ancestors are about four times as numerous as their chestnut ones."

In demonstrating that pure dominants for black never have chestnut offspring a table is given from which it is noted that "out of the grand total of 11,821 matings of these 76 horses, only 16 foals remain permanently recorded as chestnut, or 0.13 per cent of exceptions. Of these 16, 12 never ran nor were sold at auction, some died young, and the remainder are untraceable."

The author next draws attention to the fact that the number of those sires which have chestnut grandparents and second, the number of those grandparents, come out in very close accordance with the law of probability. It is concluded that segregation of alternative factors is a true law in the heredity of coat color, and that the unit characters for black points and absence of black points are transmitted quite independently of all other hereditary units.

The possible combinations arising in the mating of impure dominant black, brown, and bay sires with impure dominant mares, and also with chestnut mares, are discussed.

The cause of grayness appears to be a peculiarity in the minute thread-like channels which connect the pigment-producing cells with the hair follicles. It is thought that there is a structural modification in the tiny canals rendering them too small to allow of the passage of pigment granules. This structural peculiarity is transmitted independently of the determining factors for the various coat colors. This view of the cause of grayness, while recently held by Walther, is not accepted by certain other investigators, who regard "grayness" as a unit character which is alternative to black, brown, bay, or chestnut.

The author points out that in youth the hybrid gray is usually whole colored and gradually develops the inhibitory factor. With exceedingly rare and

doubtful exceptions, the inhibitory unit never remains latent or recessive throughout the whole life of the horse, hence the law that "every gray or roan must have at least one gray or roan parent and that two whole colors can not give rise to gray or roan. Once the gray line is broken there is no reversion in a subsequent filial generation to gray ancestors."

It is shown that while there are apparent Stud Book exceptions to this rule, they all contain a grave element of doubt. The mating of pure grays gives rise to gray offspring solely. In mating impure grays together four possible combinations would occur in fertilization, each being equally likely, namely: (1) Purity for the inhibitory factor, the offspring possessing a black skin and a white or nearly white coat; possibilities of the occurrence of impurity for the inhibitory factor resulting in either (2) a fine or (3) a coarse mosaic of pigmented and unpigmented hairs; and (4) a pure whole color, which even though mated with similarly extracted whole colors will never throw reversions to gray.

Reference to the table of matings shows that the proportion of whole colors to grays accords very closely to the expected 1:3 proportion, and an investigation indicates that none of the extracted whole colors from these matings ever threw reversions to gray. In the mating of impure grays with whole colors there are two kinds of offspring possible, impure grays and whole colors, in approximately equal numbers.

In concluding the author states that "what the heredity of coat color principally teaches us is that inheritance recognizes no such limitations as undeviating tail-male or tail-female descent, and that weight of ancestry plays a very minor part in heredity. In the transmission of gray it plays no part whatever, for the inhibitory factor which is responsible for this condition still holds its own with undiminished vigor in spite of the overwhelming preponderance of whole-colored ancestry in the pedigrees of gray thoroughbreds."

See also a previous note (E. S. R., 30, p. 673).

Tables for statisticians and biometricians, edited by K. PEARSON (*Cambridge, England, 1914, pp. LXXXIII+143*).—This includes 55 tables of interest to statisticians and biometricians.

Action of sugar in nutrition, A. GOUIN and P. ANDOUARD (*Compt. Rend. Soc. Biol. [Paris], 74 (1913), No. 19, pp. 1082-1084*).—A three-months-old calf was fed for 11 weeks, during the first four weeks on a ration high in amid content (potatoes and manioc), and during the last six weeks a saccharose feed in which carob-bean meal predominated. During the first period the ration contained 218 gm. of saccharose per 1,000 kg. weight, and during the second period 420 gm. The average daily increase in weight was 821 gm. in the first period, and 905 gm. in the second. There was found to be a reduction in the amount of urine secreted, in the urinary nitrogen, and in the nutrients digested, with the increased allowance of saccharose.

The effect of sugar on the digestion of nitrogen, A. GOUIN and P. ANDOUARD (*Compt. Rend. Soc. Biol. [Paris], 75 (1913), No. 36, pp. 550-552; abs. in Internat. Inst. Agr. [Rome], Mo. Bul. Agr. Intel. and Plant Diseases, 5 (1914), No. 3, pp. 380, 381*).—In experiments to determine the influence of sugar on the utilization of nitrogen, pigs were fed during two periods of 42 days each, the first period on peanut cake, degelatinized bone meal, and manioc roots, and the second period on peanut cake, degelatinized bone meal, and Jerusalem artichokes.

During the first or starch period the average daily increase in weight was 667 gm. per head and during the second or sugar period 595 gm. The manioc starch was always completely utilized, while the sugar of the artichokes was often

only incompletely taken up. Due to a less intense bacterial activity in the sugar period than in the starch period the quantity of nitrogen transformed into gas in the stomach was diminished from 9.48 to 0.07 per cent. During the starch period the pigs excreted in the feces an average of 25.93 per cent of the nitrogen of the feed and during the sugar period 48.73 per cent.

These results corroborate observations made in previous experiments with a heifer calf (E. S. R., 27, p. 871), and a steer (see above), and indicate that sugar diminishes the utilization of nitrogen and the loss of nitrogen by fermentation in the alimentary canal.

Comparative feeding experiments with various grades of low moor, high moor, marsh, and mineral land hays, B. TACKE ET AL (*Ber. Landw. Reichsamte Innern*, No. 32 (1914), pp. 47).—This comprises three papers reporting various comparative feeding experiments with oxen and sheep fed different sorts of marsh and moorland hays. The coefficients of digestibility and the digestible nutrients of the various hays are shown in the following table:

Coefficients of digestibility and digestible nutrients of the various hays.

Kind of hay.	Coefficients of digestibility.				Crude fiber.	Digestible nutrients.			
	Dry matter.	Protein.	Fat.	Nitrogen-free extract.		Protein.	Fat.	Nitrogen-free extract.	Crude fiber.
	<i>Per ct.</i>	<i>Per ct.</i>	<i>Per ct.</i>	<i>Per ct.</i>	<i>Per ct.</i>	<i>Per ct.</i>	<i>Per ct.</i>	<i>Per ct.</i>	<i>Per ct.</i>
Marsh hay.....	57.5	61.8	47.0	59.9	62.2	6.67	1.16	27.10	19.83
High-moor hay.....	65.0	69.3	47.0	67.4	62.8	11.18	1.10	31.34	16.93
Low-moor hay.....	56.9	61.5	57.5	58.3	55.9	5.71	1.30	27.40	19.90
Clover hay.....	61.0	69.1	59.1	64.4	55.3	10.97	1.20	28.38	17.24

The influence of long storage on the composition and digestibility of meadow and clover hays, F. HONCAMP, H. MÜLLNER, and B. STAU (*Landw. Vers. Stat.*, 84 (1914), No. 5-6, pp. 447-481).—In feeding experiments with sheep it was demonstrated that under desirable storage conditions meadow hay suffers no loss in nutritive value. During three years' experiments comprising five periods the nutrients remained practically the same if not higher and the digestibility was increased. During two years comprising six periods in which clover hay was fed no material change in nutritive value of the hay was noted in either composition or digestibility.

The feeding value of apple pomace, J. B. LINDSEY (*Massachusetts Sta. Circ.* 47 (1914), pp. 4).—A popular summary of data, based largely on work previously noted (E. S. R., 16, p. 395; 17, p. 279; 26, p. 72).

Bacteriological researches on forage conservation in the silo, C. GORINI (*Ann. Ist. Agr. [Milan]*, 5 (1901-1904), pp. 97-100; 6 (1901-1905), pp. 105-122, pl. 1; 7 (1905-6), pp. 47-57; 8 (1906-7), pp. 49-68; 9 (1907-1909), pp. 85-92; 10 (1909-1911), pp. 95-112; 11 (1911-1913), pp. 165-175).—These are reports of bacteriological studies made of silage during a period of years. The author makes four classes of silage, those in which butyric acid, lactic acid, and putrefying bacteria predominate, and that which is comparatively free from bacteria. The first two classes are normal and the last two abnormal, the third because fermentation has been too low, thus causing putrefaction, and the last because the temperature has been too high, thus destroying the bacteria.

The optimum temperature for lactic acid bacteria is given as 50° C. (122° F.), and for butyric acid bacteria 60°. The author prefers the lactic acid silage for

dairy cows, as the butyric acid silage has a tendency to taint the milk and butter. In preliminary experiments in inoculating the silage with lactic acid bacteria it was found that such inoculation appears to improve the keeping qualities of the silage, although all lactic acid cultures do not act alike. Even at a relatively low temperature it is possible to make excellent silage by such inoculation.

[Ensilage experiments with lactic acid culture], T. REMN and F. WEISKE (*Bl. Zuckerrübenbau*, 21 (1914), Nos. 11, pp. 168-173; 13, pp. 201, 202).—In these studies it was found that the inoculation of ensiled beets, or of clover hay, with a specially prepared lactic acid culture materially increased the acidity of the silage, facilitated the fermentation process, and improved the quality of the silage.

A new process of preparing potatoes for acid ensilage with pure cultures of lactic bacteria, G. FOTH (*Ztschr. Spiritusindus.*, 37 (1914), No. 8, p. 103, fig. 1; *abs. in Internat. Inst. Agr. [Rome]*, *Mo. Bul. Agr. Intel. and Plant Diseases*, 5 (1914), No. 5, pp. 693, 694, fig. 1).—This process consists in the addition of a lactic ferment to equal amounts of steamed potatoes and cold grated potatoes thoroughly mixed at 55° C. (131° F.). After this mixture is thoroughly kneaded and the ferment evenly distributed, the mass is discharged into a wagon. Other hashed forage, such as mangel leaves and potato haulm, may be added to acidify the steamed potatoes, and when available, brewers' grains may be substituted for the grated potatoes.

Agriculture in Argentina, A. HERMES and H. HOLTMEIER-SCHOMBERG (*Ber. Landw. Reichsanst. Innern*, No. 29 (1913), pp. 125-267).—With reference to live stock in Argentina tables are given showing the development since 1888. It is stated that the Province of Buenos Aires possesses more than one-third of all the cattle, one-third of the horses, and nearly one-third of the sheep and pigs of the Republic. The live stock has been greatly improved by the introduction of pure-bred stock from Europe and the United States. Tables are given showing the number and value of stock imported from various countries.

In the importation of horses, Thoroughbreds are the only type of light horse which has acquired a real importance in Argentina. The acclimatization of the Hackney was highly successful, and large numbers are bred on the best estancias. Among the heavy draft horses, Clydesdales, Shires, and Percherons are popular. Other breeds have been introduced and all seem to give satisfaction.

Among the cattle the breeds rank in popularity as follows: Shorthorn, Hereford, and Aberdeen-Angus. The beef-producing types are the most prevalent. Large numbers of sheep have been imported from England, France, and Germany, principally the Rambouillet and Lincoln breeds, the latter being crossed with Merinos. Neither the long wool breeds, aside from the Lincolns, nor the Down breeds have made much progress.

It is stated that the total number of dairy farms has greatly increased in the past few years, but that the industry is still in its early stages. Typical farms are described and a bibliography is appended.

The Flemish breed of cattle, H. RAQUET (*Vie Agr. et Rurale*, 3 (1914), No. 24, pp. 673-676, figs. 2).—An account of the breed characteristics and utility value of this breed of cattle. The average annual milk production is given as between 3,500 and 5,000 kg., containing ordinarily 4.5 per cent fat. In addition to its milking capacity the breed is well adapted for beef production.

Red Flemish cattle, H. RAQUET (*Ann. Gembloux*, 24 (1914), No. 2, pp. 81-102, pl. 9; *abs. in Internat. Inst. Agr. [Rome]*, *Mo. Bul. Agr. Intel. and Plant Diseases*, 5 (1914), No. 6, pp. 790, 791).—It is stated that as milkers these cattle are almost equal to the Dutch breed when under a favorable system of manage-

ment, one herd producing an average of from 780 to 1,080 gal. per year. The breed is very adaptable, having been successfully established in portions of Spain, Argentina, and Brazil. The author states that there are three classes: (1) The milking type, red with a black nose; (2) the beef type, produced by crossing with the Shorthorns, red with a pink nose; and (3) the general purpose type with predominant milking qualities, red and white with a pink nose.

Observations on the origin and distribution of breeds of cattle in French West Africa, H. J. DE CORDEMOY (*Agr. Prat. Pays Chauds*, 14 (1914), No. 130, pp. 24-36; *abs. in Internat. Inst. Agr. [Rome]*, *Mo. Bul. Agr. Intel. and Plant Diseases*, 5 (1914), No. 7, pp. 912, 913).—An account of the origin, distribution, and utility value of the breeds of cattle of this section, which include both the zebu, or humped ox, and the humpless (taurine) type.

Origin of caracul sheep, C. C. YOUNG (*Jour. Heredity*, 5 (1914), No. 10, pp. 445-447).—The author concludes from his observations that the caracul breeds, which are broad-tails, resulted from crosses of long-tail sheep on fat rumps, the former the black Danadar, the latter the Duzbai.

Quality in wool, P. G. BAILEY and F. L. ENGLEADOW (*Jour. Agr. Sci. [England]*, 6 (1914), No. 3, pp. 349-370, figs. 9).—In the course of studies made to determine more accurately the influence of fineness of fiber upon the "quality" in wool, 700 slides were prepared and about 30,000 measurements made. At shearing, samples were taken from both of the shoulders, the neck, the breech, and the belly, an attempt being made to take the samples from similar positions on every sheep. The bulk of the wool was sorted by a skilled sorter, representative samples being retained by the investigators for measurement and study. The authors summarize the results of their investigation as follows:

"The method of taking four subsamples and making in all 160 measurements of these subsamples gives a satisfactory value for the average diameter of the sample. The average of the samples from each shoulder gives a good indication of the shoulder for each sheep.

"In comparing two sheep A and B we may take as almost certainly significant a difference between their two average shoulder diameters of some 8 per cent of the average shoulder diameter of either of them for measurements taken as here indicated. A relationship exists between the fineness as measured by the average diameter and the commercial quality into which the wool is graded. But this relationship is not absolute and is not modified by various other factors. The average T_1 diameter (diameter at the tip) is the best guide from a genetic point of view as to the fineness of the wool concerned, owing to the marked pathological influences which may affect the T_3 (base) average. The distribution of the fibers of different sizes has a modifying effect upon the commercial quality which would be assigned from a consideration of the average size only. It is suggested that the standard deviation of the distribution of the fibers should be used as a measure of this modifying effect."

South African sheep and wool, W. M. MCKEE (*Cape Town*, 1913, pp. XVI+526, figs. 35).—An account of the history and development of the Merino, Rambouillet, and other wool-producing breeds of sheep in South Africa, and a discussion of methods of feeding, care, and management of these sheep, the preparation and care of wool for market, fitting sheep for show, and other related topics.

Influence of feeding on the morphological and physiological conditions of the animal body, H. HENSELER (*Kühn Arch.*, 3 (1913), pt. 2, pp. 243-361, pls. 3, figs. 8; 5 (1914), pp. 207-288, figs. 20).—This treatise gives in detail the results of body measurements and weighings made of fat and lean swine, and of swine under various conditions of feeding. Studies were made of the influence

of feeding on the size of body, breast cavity, length and character of ribs, nature of the blood, size of lungs and heart, size of intestinal canals, the secretions and functionings of the stomach, the size of pelvis and croup, character of the central nerve system, the spinal canal, and the sense organs. The work of von Nathusius with swine and of Fischer with calves is cited.

The effect of calcium and protein fed pregnant swine upon the size, vigor, bone, coat, and condition of the offspring, J. M. EVVARD, A. W. DOX, and S. C. GUERNSEY (*Amer. Jour. Physiol.*, 34 (1914), No. 3, pp. 312-325, figs. 5).—In preliminary experiments conducted at the Iowa Station three lots of pregnant gilts were fed, lot 1 receiving shelled corn, lot 2 shelled corn and approximately 2½ gm. of calcium (in salts) daily, and lot 3 shelled corn and about 136 gm. of black blood albumin (88.24 per cent protein) daily. Average daily gains per head were made for lot 1 of 107.95, lot 2 of 154.68, and lot 3 of 237.23 gm., and they farrowed an average of 7.88, 7.3, and 8.22 pigs per sow, the litters weighing an average of 6,454.62, 6,695.02, and 7,838.08 gm. for the respective lots. The relative influence of calcium and protein is shown in the following table:

Comparative influences of calcium and protein fed the pregnant dam on the developing fetus.

Characteristic of offspring.	Increase over corn alone.	
	Calcium ration.	Protein ration.
	<i>Per cent.</i>	<i>Per cent.</i>
Vigor.....	5.97	35.00
Coat quantity.....	6.38	24.42
Coat color.....	9.89	38.04
Condition.....	16.46	7.17

The following were among the conclusions drawn:

"The addition of calcium (allowed as chlorid and carbonate) to a fixed basal ration of corn and sodium chlorid with pregnant gilts resulted in new-born pigs having greater size, more vigor, bigger bone, increased coat quantity, better coat color, and higher condition. . . . The influence of the complex organic protein is more marked generally than that of the more simple inorganic calcium. The use of chlorid as the source of calcium was not as satisfactory as the carbonate in a high protein ration."

[Swine feeding experiments] (*Mitt. Ver. Deut. Schweinezüchter*, 21 (1914), No. 17, p. 330).—One-hundred-lb. pigs fed a basal ration of 1½ lbs. barley meal, ¾ lb. bone meal, and 2½ qt. skim milk per head per day, and a supplementary feed of 10 to 12 lbs. steamed potatoes, made 1.6 lbs. average daily gain, while those fed a supplementary feed of potato flakes made a similar gain of 1.6 lbs.

[The antiquity of the horse in South America], A. CARDOSO (*An. Mus. Nac. Hist. Nat. Buenos Aires*, 24 (1913), pp. 445-460, fig. 1).—The author takes exception to the contention of Trouessart (*E. S. R.*, 30, p. 174) relative to the prehistoric existence of the horse in portions of South America and claims a more recent origin.

The teeth of the horse and its age, S. T. D. SYMONS (*Dept. Agr. N. S. Wales, Farmers' Bul.* 87 (1914), pp. 3-42, figs. 83).—An explanation of methods of determining the age of horses by the condition of their teeth.

Short-faced Abyssinian mules, P. DECHAMBRE (*Bul. Soc. Nat. Acclim. France*, 61 (1914), No. 5, pp. 129-132, figs. 2; *abs. in Internat. Inst. Agr. [Rome]*, Mo. *Bul. Agr. Intel. and Plant Diseases*, 5 (1914), No. 6, p. 789).—An account

of a type of Abyssinian mule having as its regular characteristic a depression of the base of the subnasal bone, together with an underhung jaw giving the animal a bulldog expression. These animals are small, strong, and well ribbed. It appears that they are the result of purely accidental variations which are not inherited.

The bare necks, C. B. DAVENPORT (*Jour. Heredity*, 5 (1914), No. 8, p. 374, fig. 1).—An account of chickens brought from the Barbados which are characterized by the absence of feathers from the neck as far as from the ears down to the clavicle. Mated together these birds gave a few full-feathered chicks, but about three-fourths of all were bare necked. Mated to ordinary fowl, about one-half of the offspring had naked necks.

It is concluded that the naked neck is a typical dominant and that there is a factor in this bird which interferes with the development of the neck feathers. The author suggests that "every skin plate bears a feather and that if any portion of the skin is without feathers, it is due to a specific inhibitor to the development of the feather germ in that region. Of these inhibitors there are probably a number. There are at least one for the shanks and one for the neck and possibly an additional one for the ventral patch of the neck. So far as we have gone it seems probable that the inhibitor is of the nature of an antienzym which interferes in a given area with the development of those enzymes that induce the formation of the feather."

Variations caused by various feeds on ducks belonging to the same brood, A. MAGNAN (*Ann. Sci. Nat. Zool.*, 9. ser., 19 (1914), No. 2-6, pp. 161-225, figs. 35).—A part of this work has been noted from another source (*E. S. R.*, 27, p. 774).

Rouen ducks on a fish diet showed a much greater relative development of proventriculus than those fed flesh, insects, or vegetables. The length and weight of the ceca were much greater on vegetable diet. Thickness of the muscular wall of the gizzard and weight of the stomach were greatest on flesh diet. The intestinal surface, length of large intestine, and weight of spleen and blood were greatest on vegetable diet. Length and weight of the small intestine, and weight of the lungs and pancreas were greatest on fish diet. The weight of heart was greatest on fish and insect diets and equal in the two cases.

An extensive bibliography is included.

DAIRY FARMING—DAIRYING.

Present state of the dairying industry in Bombay, J. B. KNIGHT and E. W. HORN (*Dept. Agr. Bombay Bul.* 56 (1914), pp. 14).—An account of the breed characteristics and utility value of the several breeds of dairy cattle and milk-yielding buffaloes of Bombay. The necessity of improved methods of selection and breeding is suggested.

Experiments on the profitable feeding of milch cows, H. GOLDSCHMIDT (*Dansk. Land [Copenhagen]*, 1 (1913), Dec., pp. 453-470; *abs. in Internat. Inst. Agr. [Rome]*, *Mo. Bul. Agr. Intel. and Plant Diseases*, 5 (1914), No. 8, pp. 1050, 1051).—In a preliminary experiment conducted at the Royal Veterinary and Agricultural College, Copenhagen, in which 20 milch cows were fed lucern hay ad libitum, it appeared that the weight and performance of the individual cows did not stand in any approximately constant relation to the quantity of lucern consumed, and that the older and drier the lucern, the less of it was eaten.

Two lots of 10 cows each were fed 77 lbs. lucern and 2.2 lbs. straw, lot 1 receiving in addition 1.02 lbs. of oil cake for every 10 lbs. of milk, and lot 2 an equivalent amount of nutrients, or 1.33 lbs. of oats for every 10 lbs. of milk,

for 25 days, after which the lots were reversed for 20 days. In both groups the greatest yield of milk was obtained with the oil cake. From this it is concluded that "it is comparatively easy to force the yield of milk by the use of protein at the expense of the fat contained in the body, when the cows are in good condition, while it is difficult to do so with carbohydrates at the expense of the protein-containing tissues of the body."

It is suggested that as long as the lucern is young, that is, up to about June 15, it may be supplemented by mangolds (or if necessary cereals, etc.). From June 15 to about August 15 the lucern, being older, may be fed with oil cake, or, if it is fed in smaller rations, with oil cake and cereals, etc. From August 15 to about September 10 it should be supplemented by oil cake and mangolds.

Manuring for milk (*Midland Agr. and Dairy Col., Manuring for Milk 1913, pp. 12, pl. 1, fig. 1*).—In these experiments, which covered a period of four years, pastures composed principally of cocksfoot, tall fescue, and white clover were fertilized with superphosphate and sulphate of potash, and the yield in milk compared with pastures not so fertilized. A total of 373 gal. more milk per acre was obtained during the four years on the fertilized pastures, and their carrying capacity and profits were increased.

Cost of production of milk, A. MURRAY (*Midland Agr. and Dairy Col., Prelim. Rpt. Cost Milk Prod. 1913, pp. 10*).—From his preliminary investigations on this subject, the author concludes that the chief factor contributing to the high production cost of milk is the excessive use of concentrates, and next to that the excessive use of long hay. Where roots are liberally fed the cost of production is proportionately decreased.

New method of calculating the production value of feedstuffs for dairy cattle, G. FINGERLING (*Fühling's Landw. Ztg.*, 63 (1914), No. 6, pp. 185-189).—The author takes exceptions to Hansson's proposal (*E. S. R.*, 31, p. 371), that Kellner's protein factor of 0.94 be increased in estimating the production value of feeding stuffs for dairy cattle. It is contended that milk production depends largely upon fat and carbohydrate elements rather than protein, and that since Kellner's figure represents production value for body growth it is also suited to milk production. Also, since the utilization of protein by the dairy cow will depend upon the lactation period and the producing capacity of the animal, the protein figure will be variable. The author prefers a feed standard on a safe basis and believes that for practical use the Kellner estimates are the best.

A new record milk yield (*Breeder's Gaz.*, 66 (1914), No. 22, pp. 910, 912).—It is reported that in a semiofficial test, completed November 13, 1914, the 5-year-old Holstein-Friesian cow Tilly Alcartra, owned by a California firm, finished the year with 30,452.6 lbs. of milk and 951.3 lbs. of milk fat to her credit, and is believed to be the only 30,000-pound milch cow in the world. During the year she consumed a total of 1,828 lbs. each of barley, oats, and bran, 1,208 lbs. oil meal, 681½ lbs. dried beet pulp, 3,226 lbs. corn silage, 10,122 lbs. hay, and 15,140 lbs. mangels, which at market prices is estimated to have cost \$149.88.

Segregation of fat factors in milk production, F. B. HILLS and E. N. BOLAND (*Proc. Iowa Acad. Sci.*, 20 (1913), pp. 195-198).—In a microscopical study of a large number of samples of milk, the authors divided the globules into three classes, as regards size, all under 0.0016 mm. in diameter being in the first class, those ranging from 0.0016 to 0.0032 mm. in the second class, and all over 0.0032 mm. in the third class. Numerous counts of the globules were made in samples of milk ranging in fat content from 2.8 to 7.2 per cent.

There was found to be a positive correlation between the percentage fat composition of the milk and the number of fat globules of different sizes, the coefficient being 0.19. In the milk testing 2.8 per cent fat, 66 per cent of the number of globules were in the first division, 28 per cent in the second, and 6 per cent in the third; in the 7.2 per cent milk, 47 per cent in the first division, 40 per cent in the second, and 16 per cent in the third.

In a study of inheritance of fat production, as shown by the relation of the production of dams to that of their offspring, 3,700 pairs of variates were taken from the 1910-11 Official Yearbook of the Advanced Registry of the Holstein-Friesian Association. "The mean fat production of the offspring was 16.952 ± 0.039 , while that of the dams was 15.971 ± 0.034 . The standard deviation and coefficient of variability of the offspring were also greater than those of the dams, showing the tendency of the individuals of the F_1 generation to reach the extremes of the parental generations. The correlation coefficient of 0.29 would, according to the statistical method of study of biparental inheritance, show evidence of prepotency on the part of the dams as opposed to the sires. This fact may indicate a sex-linkage of the factors controlling inheritance of fat production.

"A rearrangement of the data, used in the work just discussed, in classes representing three generations, shows the following coefficients of variability—parental generation, 21.686, F_1 generation 18.737, and F_2 generation 21.824." It is stated that this is typically Mendelian.

In an attempt to distinguish the unit of inheritance in fat production, a dividing point that separated into two classes was readily recognized. The breeding records of the granddams, classified into different groups with the pound as the unit, were tabulated and compared. It was found that "the granddams having records above 21 lbs. produced F_2 descendants, as follows: Fifty-four above 21 lbs. and 60 below. The granddams below 21 lbs. produced 764 below 21 lbs. and 104 above. The latter appears to be a 7:1 ratio, indicating a linkage of two factors—one a pure dominant, the other probably sex-linked acting in a simple 3:1 ratio."

The composition of milk as shown by analyses of samples of known purity made by the Massachusetts State Board of Health, H. C. LYTHGOE (*Jour. Indus. and Engin. Chem.*, 6 (1914), No. 11, pp. 899-908, figs. 7).—A large number of samples of milk of known purity were examined in the laboratory of the food and drug inspection of the Massachusetts State Board of Health for total solids, ash, fat, protein, lactose, and milk serum.

Excluding some of the abnormally high figures the percentages of variation were as follows: Solids from 31 per cent above to 19 per cent below the average; fat from 66 above to 41 below; proteins from 38 above to 27 below; sugar from 15 above to 10 below. The variations calculated from the analyses of the herd milk are much less than those obtained from the milk of individual cows. Variations in the composition of milk are due primarily to the breed, and to a less extent the season of the year and the period of lactation.

A study of the seasonal variation showed that "milk obtained in the winter is the best, that obtained in the summer is the worst, while milk obtained in the spring and fall is a mean of the summer and winter samples. . . . The period of lactation appears to have no influence upon the variation by season. . . . All the results are affected by the seasonal variation, and all but the sugar and serum figures are affected by the period of lactation. The protein-fat ratio and the percentage of fat in the solids of these samples were not materially affected either by the season or by the period of lactation."

The percentage of fat in the solids decreases with the solids, being 38 per cent in Jersey milk and 27 per cent in Holstein milk. The amount of proteins

in the solids is fairly constant at about 25 per cent. As the ash is nearly constant the percentage of ash in solids increases as the solids diminish, being 4.9 per cent in Jersey milk and 6.7 per cent in Holstein milk. Sugar is also nearly constant and the percentage in the solids increases as the solids decrease, being 30 per cent in Jersey milk and 40 per cent in Holstein milk. Hence, both the ash and lactose content are of value in detecting added water.

It is stated that "it is possible, within reasonable limits, to indicate from the percentage of solids and fat whether or not a sample has been watered, skimmed, or is normal milk. No relation exists between the refraction of the serum and the sour serum ash; therefore, if both figures are below the minimum for pure milk it is positive indication of the presence of added water. The protein-fat ratios in all cases have been less than 1. If this figure exceeds 1, skimming is indicated, the amount being greatest in samples possessing the highest ratio. If the protein-fat ratio is less than 0.7, or the percentage of fat in the solids is above 35, samples may be declared watered by a low refraction of the serum, not necessarily below the minimum for all samples of known purity. This is particularly so when dealing with herd milk. In the absence of a refractometer, the specific gravity or the percentage of solids of the serum is just as valuable as the refractive index in detecting added water."

The iron content of milk, F. E. NOTTBOHM and G. DÖRR (*Ztschr. Untersuch. Nahr. u. Genussmtl.*, 28 (1914), No. 9, pp. 417-424).—From their studies the authors find that the normal iron content of milk, on the basis of Fe_2O_3 , is between 0.03 and 0.13 mg. in 100 cc., the majority of samples ranging between 0.03 and 0.07 mg. Toward the end of the lactation period the iron content increases. An increase in the iron content due to inflammatory conditions of the udder (mastitis) can not always be counted on. The feeding of saccharated iron to cows apparently does not increase the normal amount of iron in the milk.

Dairies and cow sheds.—Their effect upon the purity of the milk supplied to military hospitals, troops, and married families, E. B. DEWBERRY (*Jour. Roy. Army Med. Corps*, 21 (1913), Nos. 5, pp. 570-580, figs. 4; 6, pp. 676-683).—General instructions are given on the construction and care of cow sheds and the sanitary care of milk.

Shrinkage in handling milk at city milk plants (*Cream. and Milk Plant Mo.*, 3 (1914), No. 3, p. 22).—Estimates were obtained from 41 dealers by the Dairy Division of the U. S. Department of Agriculture as to the daily losses in the handling and delivery of milk. These estimates, which include all losses in handling milk from the time it is shipped, varied from 0.5 to 4 per cent and averaged 2.15 per cent of the amount handled by each dealer. Investigation revealed many unnecessary leaks which appear to be negligible but amount to a considerable sum in the course of a year. Among the ways in which these losses occur are the following: "Leaky cans; dented or battered cans; cans not full; careless handling of cans, both in transferring from cars and in dumping; inefficient draining of cans; leaky or battered apparatus; filters out of repair, as leaky valves; losses at the filler (this may be caused by the valves not being properly adjusted, carelessness in handling, breakage of bottles, etc.); carelessness in handling full cases of milk, thus breaking the bottles; loss from not removing all the milk from the pasteurizer, pipes, pumps, tanks, or other apparatus; loss from the process of pasteurizing and clarifying, by evaporation and mechanical losses."

Experiments with commercial and homemade starters, L. FUNDER (*Aarsber. Offentl. Foranst. Landbr. Fremme*, 1913, III, *Statsforanst.*, pp. 687-720, figs. 3; *abs. in N. Y. Produce Rev. and Amer. Cream.*, 38 (1914), No. 14, p. 592).—The results of these experiments are summarized as follows:

"All the starters tested have generally produced butter of a satisfactory quality. The butter from homemade starters was equal to that from commercial ones. The keeping quality of the butter was about the same for both. The starters which gave the best results at the butter scoring are the same which have maintained their quality the longest.

"The best butter has universally been obtained when the acidity (of the starter) has been 39 to 40° Soxhlet-Henkel (0.8775 to 0.9 per cent). An acidity of up to 44° (0.99 per cent) can hardly be said to have hurt the butter, but the quality drops universally with lower acidity. The titration numbers show considerable variations from day to day. In order to ascertain the acidity the titration must be repeated often. The starter used showed generally 1.2° (0.25 per cent) higher than the mother starter.

"The quality of the butter is improved universally with the tasting score of the starter, and with the acidity up to about 40° (0.9 per cent), but the quality agrees better with the acidity than with the taste of the starter. A palatable sharp starter has as a rule a high titration number, and a poorly tasting one as a rule a lower acidity than normal. The starters with which have been used a long ripening time have uniformly given better results than those with short ripening time. The drop in the temperature in the starter while ripening is all the greater the higher the temperature when starting, and the smaller the quantity of milk used. Hence the effect of using a high commencing temperature is partly lost, but depends furthermore on the quantity of milk used and the quality of the insulation. The starters used have had no effect on the moisture in the butter."

VETERINARY MEDICINE.

A text-book of bacteriology, P. H. HISS and H. ZINSSER (*New York and London, 1914, 2. ed., pp. XVI+766, figs. 156*).—This is the second edition of this practical treatise on bacteriology, which is intended for students and practitioners of medicine.

A text-book of general bacteriology, E. O. JORDAN (*Philadelphia and London, 1914, 4. ed. rev., pp. 647, pls. 2, figs. 178*).—This edition of this work (E. S. R., 24, p. 717) has been thoroughly revised and some new material added, including a new chapter on the filterable viruses.

Blood pressure.—Its clinical applications, G. W. NORRIS (*Philadelphia and New York, 1914, pp. VIII+372, pl. 1, figs. 98*).—In the first chapter of this work J. H. Austin deals with the physiology of blood pressure. A description of the various instruments used and the relative advantages of the different methods of determining blood pressure follows. Venous and capillary pressure are discussed briefly and methods of determining functional efficiency of the circulation are described at some length. The remaining part, or about one-half of the book, relates to the clinical applications of blood pressure.

Special pathology and therapy of the domestic animals, F. HUTYRA and J. MAREK (*Spezielle Pathologie und Therapie der Haustiere. Jena, 1913, 4. ed., rev. and enl., vols. 1, pp. XVI+1144, pls. 12, figs. 231; 2, pp. XIV+1088, pls. 7, figs. 207*).—This edition contains in addition to the material previously noted (E. S. R., 26, p. 82), chapters on paratyphoid of pigs, Ascoli's precipitin reaction for anthrax and erysipelas, sporotrichosis, and the salvarsan treatment for the pectoral form of equine influenza. The chapter on protozoan diseases has been revised. Under organic diseases new chapters on catarrh of sphenoidal sinus, Heine-Medin's disease, guinea pig paralysis, lingual paralysis, tetany, necrobacillosis, otitis, and osteomyelitis, have been added and others rewritten. Data pertaining to Borna disease have been separated from the

remaining forms of meningo-encephalomyelitis (meningitis cerebrospinalis enzootica) and rewritten.

A study of *Bacterium mallei*, with special reference to the "körnige" form, H. CLARKE (*Cornell Vet.*, 4 (1915), No. 4, pp. 164-170).—" *B. mallei* does not form gas or acid in the sugars studied. It coagulates milk in from 10 to 20 days. The morphology of *B. mallei* varies in different strains. The so-called 'körnige' form exists in certain strains obtained from animal tissues and cultures. This form as far as could be determined has no relation to virulence."

A quantitative application of the Abderhalden serum test, D. D. VAN SLYKE and MIRIAM VINOGRAD (*Abs. in Proc. Soc. Expt. Biol. and Med.*, 11 (1914), No. 5, p. 154).—The authors claim that the Abderhalden serum test may be greatly simplified, made quantitative, and the sensitiveness increased about thirty-fold as compared with the dialysis test, by utilizing the nitrous acid method to detect proteolysis.

"The technique is the following: 2 cc. of serum is digested with 0.1 gm. of dried substrat (tissue prepared according to Abderhalden's directions and dried quickly at 0.5 mm.), or, as nearly as can be estimated, 0.4 gm. of undried substrat. After the digestion is complete, 3 cc. of water is added. The solution is then centrifuged and 2 cc. used for amino nitrogen determination in the microapparatus, 0.5 cc. of caprylic alcohol being used to avoid foaming and the reaction being run four minutes. Control analyses are run under the same conditions with serum that has been digested with normal tissue, and with no tissue. The amino method will detect one-fourth the concentration of α -NH₂ that is apparent by the ninhydrin reaction, and the serum is diluted only one-eighth as much in the above procedure as in the dialysis test, so that the sensitiveness is increased about thirty-fold."

In spite of the results yielded by the test absolutely negative results were obtained with the Rous chicken sarcomas Nos. 1 and 2, even when the serum tested came from the chicken furnishing the tissue substrat. The results obtained are said not to bear on the validity of the test in human cases. The method is now to be tested in human cancer and in pregnancy.

Serum sensitization as related to dosage of antitoxin in man and animals, W. H. PARK, L. W. FAMULENER, and E. J. BANZHAF (*Jour. Infect. Diseases*, 14 (1914), No. 2, pp. 347-350, figs. 3).—"The results obtained in two men and in two goats showed no appreciable difference in the absorption curves of antitoxin before and after sensitization. The variations that occurred in the cases appeared to be due to the inherent individual characteristics of the persons and animals injected and not to the sensitization.

"It is concluded that the large amounts of antitoxin injected in the treatment of diphtheria are neither bound nor destroyed appreciably by any globulin antibodies present in the blood of those previously injected. The same quantity of antitoxin is therefore indicated in the treatment of diphtheria whether the case has or has not received a previous injection of horse serum or globulins."

Influence of protein content on the absorption of antitoxin and agglutinin injected subcutaneously, W. H. PARK, L. W. FAMULENER, and E. J. BANZHAF (*Jour. Infect. Diseases*, 14 (1914), No. 2, pp. 338-346, fig. 1).—"The degree of protein concentration which is usually employed to produce the refined and concentrated diphtheria antitoxic globulin preparations has little or no effect in retarding the absorption of the antitoxin from the subcutaneous tissues. The removal of water, if not pushed too far, is therefore a justifiable means of lessening the quantity of fluid to be injected.

"Any preparation which causes local inflammatory reaction lessens the rate of antitoxin absorption."

The effect of gentian violet on protozoa and on tissues growing in vitro, with especial reference to the nucleus, D. G. RUSSELL (*Jour. Expt. Med.*, 20 (1914), No. 6, pp. 545-553, pl. 1, fig. 1).—"Gentian violet may be regarded as a true vital nuclear stain. Embryonic and adult tissue of the frog will grow in vitro in the presence of gentian violet of a far stronger dilution than that necessary to kill many bacteria. In these experiments, for example, successful tissue growths were obtained when gentian violet 1:20,000 was used, yet *Bacillus subtilis* will not grow in 1:100,000 dilution and grows very badly in 1:1,000,000 dilution. This fact may simplify the technique of the growth of certain tissues by eliminating the risk of bacterial contamination."

Increasing resistance against infectious diseases with calcium chlorid, R. EMMERICH and O. LOEW (*Arch. Hyg.*, 80 (1913), No. 1-6, pp. 261-271; *abs. in Centbl. Bakt. [etc.] 1. Abt., Ref.*, 59 (1913), No. 7, pp. 194, 195).—Guinea pigs and mice which received calcium chlorid over a long period of time showed a marked resistance toward infections with anthrax and erysipelas bacteria of low virulence. When, however, anthrax bacteria of high virulence were used the disease progressed so rapidly as not to allow an observation as to whether or not an increased resistance was present. In guinea pigs pretreated with calcium chlorid a tuberculosis infection seems to run a much milder course. Therapeutic tests on man are reported and others are in progress.

Report on the civil veterinary department (including the Insein Veterinary School), Burma, for the year ended March 31, 1914, T. RENNIE (*Ann. Rpt. Civ. Vet. Dept. Burma, 1914*, pp. 4-15, pl. 1).—This report includes accounts of veterinary instruction, the occurrence and treatment of contagious diseases, etc.

Annual report of the veterinary department for the year 1912-13, R. J. STORDY (*Dept. Agr. Brit. East Africa Ann. Rpt., 1912-13*, pp. 23-41).—A report on the occurrence of animal diseases and of meat inspection work during the year.

An outbreak of anthrax due to tannery refuse, E. M. PICKENS (*Rpt. N. Y. State Vet. Col., 1912-13*, pp. 130-136).—The author's investigations show that an outbreak of anthrax on a farm in a locality previously free from the disease had its origin in a stream, into which a tannery deposited refuse, that flowed through a pasture in which the cattle were kept. This is thought to be the first time anthrax bacteria have been isolated from a contaminated stream.

Anaphylaxis after using anthrax serum, K. JÁRMAI (*Állatorvosi Lapok*, 36 (1913), No. 21, pp. 247, 248; *abs. in Deut. Tierärztl. Wchnschr.*, 21 (1913), No. 31, p. 505).—In a barn where anthrax had occurred several animals received 10 cc. of anthrax serum subcutaneously and the dose was repeated two weeks later. As cases of anthrax kept on occurring, a steer which was being fattened was given 50 cc. of serum intravenously. The animal after a few minutes came down with spasms, gaped, and stopped breathing. After 1½ minutes the breathing became superficial, the pulse was not palpable, there was muscular contraction, and from the mouth and nose flowed a frothy fluid. During this period the temperature rose to 40.6° C. After 9 hours the animal recovered.

In three other febrile animals no untoward symptoms resulted from giving 10 cc. of serum. These animals received total amounts of serum varying from 60 to 80 cc.

Foot-and-mouth disease in Europe and South America, J. E. WING (*Breeder's Gaz.*, 66 (1914), No. 21, p. 868).—The author reports upon his observations of the occurrence of foot-and-mouth disease in Europe and South America. In South America the disease is widespread, in Argentina being well-nigh uni-

versal. The importance of eradicating the disease from the United States is emphasized.

In regard to the transmission of foot-and-mouth disease to man through the agency of milk, G. SCHMIDT (*Berlin. Tierärztl. Wchnschr.*, 29 (1913), No. 42, pp. 749, 750).—A description of two cases in boys 5 and 7 years old, respectively, who drank milk from cows in a region where foot-and-mouth disease was noted later. One of the cases was especially typical of the disease in animals. Two other possible cases in man are mentioned.

The differentiation between nodules due to glanders and those caused by parasites, V. A. MOORE and C. P. FITCH (*Rpt. N. Y. State Vet. Col.*, 1912-13, pp. 115-129).—A careful study of the material available and the findings of others on the subject leads the authors to the following conclusions:

"In the lungs of horses suspected of being glandered there are frequently found nodules which are due to parasites. Similar nodules are occasionally met with in other organs such as the liver, spleen, and lymphatic glands. These parasitic nodules are frequently mistaken for those due to glanders (*Bacterium mallei*.) Macroscopically it is difficult, often impossible, to differentiate between the nodules due to parasites and those caused by the glanders organism. Microscopically the lesions due to parasites are characterized by a variable eosinophilic infiltration. Eosinophils are occasionally found associated with other lesions such as those of miliary tuberculosis, malignant tumors, and some others. Ebhardt found eosinophils associated with old glanders nodules. Their presence was probably due to stimuli other than *B. mallei*. When eosinophils are found in the microscopic examination of nodules from the lungs of suspected glandered horses, the lesions should not be considered as the direct result of glanders infection."

A bibliography of 23 titles is appended.

A new method for the diagnosis of glanders.—The intrapalpebral mallein reaction.—Preliminary note, A. LANFRANCHI (*Mod. Zooiatro, Parte Sci.*, No. 1 (1914), pp. 1-5, figs. 2).—This is a combination of the subcutaneous and ophthalmic reaction. It consists of injecting 0.25 cc. of crude mallein dissolved in 2.5 cc. of normal (physiological salt solution between the skin and mucous membrane of the lower eyelid. The usual prophylactic precautions are observed before the injection. After two hours or so the blood vessels of the conjunctiva become highly injected, a mucopurulent discharge begins to form, and the lower lid becomes swollen, reaching its maximum after 12 to 24 hours. It then also involves the upper lids and exterior of the arch of the zygoma. The reaction lasts from 48 to 72 hours. Constitutional effects such as rise in temperature (thermoreaction) are also present.

Notes on osteomalacia (bone chewing) (*Dept. Agr. N. S. Wales, Sci. Bul.* 12 (1914), pp. 23).—In addition to an introduction by F. B. Guthrie, this bulletin contains three papers, namely, A Note on the Nature and Causation of Osteomalacia in New South Wales, by M. Henry (pp. 5-7), The Osteomalacia Soils of the South Coast Districts, by H. I. Jensen (pp. 7-15), and Investigations Undertaken in Connection with "Osteomalacia" or "Bone Chewing Disease" on the South Coast, by A. A. Ramsay (pp. 16-23).

Immunizing with dead trypanosomes, K. AOKI and H. KODAMA (*Ztschr. Immunitätsf. u. Expt. Ther.*, I, Orig., 18 (1913), No. 6, pp. 693-700).—In these experiments it was not possible to immunize rabbits, rats, and mice by pretreatment with suspensions of dead trypanosomes against a succeeding infection with dourine trypanosomes. It was also not possible to immunize rats and rabbits with large amounts of dried trypanosomes.

Nephroparatyphoid and nephrotyphoid, C. KLIENEGER (*Berlin. Klin. Wchnschr.*, 51 (1914), No. 21, pp. 969-972, figs. 2).—A description of two cases

in which the urethra had become infected first with paratyphoid bacilli, but which later involved the kidneys. Up to the time when the paratyphoid bacilli (hog-cholera group) were noted one of the patients was treated for gonorrhea. The patients resided in rural districts. The agglutination titer with a polyvalent antihog-cholera serum (Wassermann) went as high as 1:327,680, and the blood picture was quite different from that of ordinary typhoid. The bacilli could be cultivated from the urine but never from the blood or intestines.

Diagnostic value of the precipitin reaction in infections with the typhoid-coli group of bacteria, and especially in meat poisoning, M. ISABOLINSKY and B. PATZEWITSCH (*Centbl. Bakt. [etc.], 1. Abt., Orig., 70 (1913), No. 3-4, pp. 192-199; abs. in Chem. Zig., 38 (1914), No. 26, Repert., p. 115.*)—The sera employed were obtained by immunizing rabbits with killed cultures. It was demonstrated with these sera that the precipitin reaction for detecting meat poisoning by the paratyphoid B and Gärtner bacilli is not absolutely specific.

The utilization of dry heated micro-organisms and those which have been treated with digestive ferments as antigens, with especial regard to tuberculosis, F. LOEFFLER (*Deut. Med. Wchnschr., 39 (1913), No. 22, pp. 1025-1029; abs. in Berlin. Tierärztl. Wchnschr., 30 (1914), No. 12, pp. 202, 203.*)—By dry heating various substances which the author and Matsuda employed as antigens (proteins, blood, parts of tissues, bacterial masses) to 70° C., germ-free antigens may be obtained. With these heated substances sera with high agglutinating and bactericidal properties may be produced, and it is possible to immunize animals against mouse typhoid and hog erysipelas.

While the organisms differ as regards their resistance toward heat, the majority die only after seven to eight days, but tubercle bacilli are killed after one to two days. By heating continuously for nine to fifteen days at 70° the resorptive ability of the tubercle bacillus is increased. This material when given to rabbits and dogs will immunize them against highly pathogenic tubercle bacilli, and the same immunity is also to be expected from bovines. Guinea pigs could not be immunized with dry heated tubercle bacilli nor could they be cured when infected with tuberculosis by this treatment. At the utmost an extension of life is obtained by the treatment of the guinea pigs.

Micro-organisms exposed to the action of carnevorin (a ferment preparation obtained from insect devouring plants, such as *Drosera*) for a sufficient length of time die, but death is preceded by a stage in which the bacteria multiply. Different micro-organisms show different degrees of reaction toward carnevorin. Some are killed in dilute solutions in a short time and others survive exposure in a strong solution for a long time. The micro-organisms robbed of their virulence by carnevorin give when injected a strong immunity toward the respective organisms. Tubercle bacilli treated with carnevorin diluted 1:2 in salt solution are killed in from 48 hours (human type) to 72 hours (bovine type). Guinea pigs can not be immunized nor cured with the organisms so treated. Further work is to be done in this direction with other species of animals and man.

Of the animal digestive ferments only trypsin in an alkaline medium was found active and compared well as regards its action with carnevorin. Tubercle bacilli treated with trypsin are well resorbed, and the curative and protective effects with guinea pigs are the same as noted with carnevorin. Rabbits treated with trypsin bear injection with tubercle bacilli very well.

The results with trypsin seem to give a basis for the belief that an infection of the intestinal tract by way of the mouth can readily occur, since some of the ferments of the digestive tract do not affect or do not have the opportunity of acting upon the micro-organisms for a sufficient length of time to kill them or

to render them noninfectious. The possibility of giving local treatment of tuberculosis is pointed out.

Dogs, which are more sensitive to human than to bovine tubercle bacilli, can be easily immunized by bacteria which have been subjected to the process of dry heating and given intraperitoneally or intravenously. After receiving 100 mg. of dry heated bacteria they can withstand an injection of from 250 to 300 mg. of living bovine tubercle bacilli. Tests were made with highly potent dog sera on guinea pigs but with unsatisfactory results. Better results were obtained with sera prepared in rabbits with the human type of tubercle bacillus. Guinea pigs were immunized against a slightly virulent strain of the human type of tubercle bacillus which had been gradually treated with trysin. This treatment increased the length of life of these animals but did not confer a complete immunity.

Investigations about the tubercle bacilli content of the feces, the blood, and the milk of cows affected with open tuberculosis, M. GRESSEL (*Untersuchungen über den Tuberkelbazillengehalt der Faeces, des Blutes und der Milch von Kühen, welche an offener Lungentuberkulose leiden. Inaug. Diss., Giessen, 1913, pp. 64; abs. in Münchener Tierärztl. Wchnschr., 57 (1913), No. 33, pp. 625, 626*).—In the feces of 13 bovines affected with open tuberculosis tubercle bacilli were noted six times by the animal inoculation test. The mere detection of acid-fast bacilli in the feces by the microscopical method does not point conclusively to tuberculosis. The blood of animals affected with a high grade of open tuberculosis does not as a rule contain tubercle bacilli. In four out of 12 cases bacilli were found by the microscopical method but not with the animal test. As a rule bovines with advanced tuberculosis without involvement of the udder do not discharge tubercle bacilli with milk, and tubercle bacilli were found in the milk of only one out of 12 animals.

The value of the tuberculin eye test, W. KONGE (*Berlin. Tierärztl. Wchnschr., 29 (1913), No. 45, pp. 800, 801*).—The conclusion reached, based on data obtained by testing 21 cows, healthy and tubercular, is that a purulent conjunctivitis obtained after injecting phymatin is diagnostic of tuberculosis.

Udder diseases and the differential diagnosis of mammary gland tuberculosis, SEILER (*Deut. Tierärztl. Wchnschr., 21 (1913), No. 31, pp. 449, 500; abs. in Centbl. Bakt. [etc.], 1. Abt., Ref., 59 (1913), No. 11, p. 349*).—A case, believed to be a pyobacillosis of the mammary gland with metastasis in the lymphatic organs, is described. Tuberculosis was absent.

Diplodinium ecaudatum, with an account of its neuromotor apparatus, R. G. SHARP (*Univ. Cal. Pubs., Zool., 13 (1914), No. 4, pp. 43-122, pls. 5, figs. 4*).—This paper deals with the morphology of *D. ecaudatum*, including *D. ecaudatum* and *D. cattanci*, together with a description of three new forms of this species, all of which are found in the first and second divisions of the stomach of western cattle.

Investigation into the morphology and life history of *Onchocerca gibsoni*, A. BREINL ET AL. (*Aust. Inst. Trop. Med. Rpt. 1911, pp. 5-17*).—The authors' observations indicate that the worm nodules occur most frequently behind the femoro-tibial joint. Careful examination of the internal organs, including the spleen, liver, heart, etc., failed to reveal the presence of any parasite akin to *O. gibsoni*. The fact that nodules occur in those parts of the animals which come in contact with the ground when the beast is resting, or with water when the cattle enter it for drinking or cooling purposes, namely, in the brisket and behind the femoro-tibial joint, is considered an important aid in the search for the means of transmission from host to host.

The investigations conducted prove that the larva of *O. gibsoni* may penetrate the thick capsule which surrounds the nodule and also the skin of the animal in small numbers. Sometimes larvæ taken out of a fresh nodule still showed slight movements after having been kept for 28 to 30 hours in water at a temperature of from 15 to 18° C. (59 to 66.4° F.) At room temperature all movements of the parasites had ceased after about 10 to 12 hours.

About 60 stable flies were experimented with on different occasions and the intestinal content examined after short varying intervals of one to two days, but in no instance could anything be found even resembling a larva. Similar experiments were carried out using mosquitoes for feeding experiments, as *Culex fatigans*, *Culicella vigilax*, and *Mansonia uniformis*, with entirely negative results. Although it was repeatedly observed that the *Onchocerca* larvæ from fresh nodules are taken up by crustaceans belonging to the genus *Cyclops*, further development of the larvæ was never observed.

Further investigations into the etiology of worm nests in cattle due to *Onchocerca gibsoni*, J. B. CLELAND (*Melbourne, Australia: Govt. [1914], pp. 56, pls. 5; abs. in Pub. Health [London], 28 (1915), No. 4, pp. 90-95*).—This is a report of investigations conducted in continuation of those previously noted (*E. S. R., 27, p. 785*). Although the author has previously expressed the opinion that the balance thus far available favors the stable fly (*Stomoxys calcitrans*), a hematophagous species, as being the insect vector concerned in the transmission of this parasite, the investigations have been extended to test other possible channels.

The more important results obtained are the determination that various Muscidae, as well as mosquitoes, can ingest the embryos of *O. gibsoni* when given access to a freshly opened nodule; that in the case of *S. calcitrans* not only can the embryos be ingested but they may remain alive and active in considerable numbers within the alimentary canal for a period of three days at least; and that in case of *Musca domestica* and *M. vetustissima*, both common flies, the embryos can be ingested, although in the few experiments conducted they have not been found alive in the alimentary canal of these flies even 24 hours after feeding. The possibility of animals acquiring partial immunity to worm nest infestation and the possibility of breeds immune to the formation of worm nests is referred to.

On the migration of the larvæ of *Onchocerca gibsoni* through the capsule of the worm nodule, W. NICOLL (*Ann. Trop. Med. and Par., 8 (1914), No. 3, pp. 609-621*).—The experiments here reported show that *Onchocerca* larvæ can and do make their escape through the capsule of the worm nodule. They usually do so in small numbers, but may at times, or in some cases, migrate in comparatively large numbers.

A bibliography of 8 titles is included.

Animal parasites, with special reference to the sheep tick (*Melophagus ovinus*) and the biting sheep louse (*Trichodectes sphærocephalus*), W. W. FROGGATT (*Agr. Gaz. N. S. Wales, 25 (1914), No. 9, pp. 765-770, pl. 1, figs. 6*).—A discussion of eight ectoparasites and their occurrence in Australia.

Concerning certain cytological characteristics of the erythroblasts in the pig embryo, and the origin of nonnucleated erythrocytes by a process of cytoplasmic constriction, V. E. EMMEL (*Amer. Jour. Anat., 16 (1914), No. 2, pp. 127-205, figs. 45*).—"In conclusion, therefore, it may be stated that the data derived from the present investigation involving the study of blood cultures, living and fixed blood vessels in the pig embryo, together with the observations of other investigations for both red and white blood cells in various mammals, raises the question whether the origin of nonnucleated erythrocytes

by a process of cytoplasmic constriction does not merit more serious consideration."

The structural unit and growth of the pancreas of the pig, G. W. CORNER (*Amer. Jour. Anat.*, 16 (1914), No. 2, pp. 207-236, figs. 19).—"The structural unit is defined as the smallest portion of an organ which is repeated in a similar way throughout, and which contains all the elemental structures of the organ. The pancreas of the adult pig is formed by the repetition, 20,000 to 30,000 times, of a structural unit about 1 mm. in diameter. The unit is more clearly outlined in the fetus than in the adult. Its size is limited to the area of supply of one arteriole. Pressure of fluid injected into the main duct of the pancreas is equally distributed to all the units. By presumption, the reverse is true, that is, all the units deliver their secretion against an equal pressure.

"The pancreatic ducts of the fetus have been injected. Statements of La-guesse and others that the early pancreatic ducts are plexiform are confirmed. The main duct of the pig's pancreas and its branches arise by dilatation of capillary ducts in the primitive plexus, in a manner similar to the origin of arteries and veins from capillaries. This observation affords a clear explanation of certain variations in the pancreatic ducts, not understood before."

Swine diseases, A. T. KINSLEY (*Chicago, 1914*, pp. 238, pls. 4, figs. 28).—This book gives a brief but well illustrated account of the diseases affecting swine, arranged as follows: Diseases of the digestive system, the respiratory system, the urogenital system, organs of locomotion, the skin, circulatory organs, and the nervous system, and infectious diseases.

Some phenomena involved in the life history of *Spirochæta suis*.—Studies on hog cholera, W. E. KING and R. H. DRAKE (*Jour. Infect. Diseases*, 14 (1914), No. 2, pp. 246-250, fig. 1).—The results of the experiments suggest that at some time in its life cycle *S. suis* is capable of passing through bacteria-proof filters. See also previous notes (E. S. R., 28, p. 381; 29, p. 681; 30, p. 383).

Hog cholera and serum treatment, G. R. WHITE (*Dept. Agr. Tenn., Farmers' Bul.*, 1914, pp. 56, figs. 33).—A general description of hog cholera and the preparation of antihog-cholera serum. Specific directions are given for vaccinating hogs against the disease. The bulletin is especially well illustrated.

Investigations on Voldagsen plague (shoat typhoid), W. PFEILER and A. KOHLSTOCK (*Arch. Wiss. u. Prakt. Tierheilk.*, 40 (1913), No. 1-2, pp. 114-183, figs. 9).—Shoats were infected with a culture obtained from a herd amongst which a hog disease, supposed to be hog cholera, prevailed. The animals in the herd failed to respond to treatment with the antihog-cholera sera of Neu-Gans, Hutyra, and the German Imperial Health Department, and the biological behavior of the organism under various cultural conditions was studied.

It was agglutinated by a Voldagsen serum in dilutions of from 1:16,000 to 1:40,000. Two strains, L. 13 and L. 16, were used in the infection tests, the purpose of which were to establish whether an infection per os is possible, to make subcutaneous and intraperitoneal tests, and to determine whether a disease similar to the one present among the pigs noted could be produced. In addition, immunizing tests with the filterable virus against a Voldagsen infection were made. Active and passive immunization tests with vaccine and serum were also made in the laboratory and field.

By feeding very small doses of a culture of Voldagsen bacteria a severe, fibrinous, intestinal inflammation was produced in shoats. It had the anatomical characteristics usually observed in acute hog cholera. It was possible to kill shoats only by giving large doses of hog-cholera bacilli followed by a dose of either *Bacillus paratyphoid* B, or *B. enteritidis*, Gärtner. The disease could also be conveyed by contact, and animals so infected usually

died. Sterile filtrates of organs from diseased animals when injected in other animals did not convey the disease. In all shoats where the disease was present *B. voldagsen* could be isolated.

From a sow showing the residue of the disease the organism could not be regained. Fresh or putrid organs when filtered conveyed neither shoat typhoid nor hog cholera. To further prove that *B. voldagsen* is not a secondary invader, and going on the assumption that an animal having recovered from an attack of hog cholera ought to be immune against the disease, shoats were exposed to animals affected by the filterable virus. The animals became diseased with hog cholera.

The immunizing tests showed that animals could be protected against massive doses of *B. voldagsen* per os by a vaccine (E. S. R., 31, pp. 87, 679) but not by a Voldagsen serum. A filterable virus antiserum would not protect against a Voldagsen infection. The reverse was also true. See also previous notes (E. S. R., 29, p. 482; 31, p. 86).

Swine pox in young pigs, J. BÁN (*Állatorvosi Lapok*, 36 (1913), No. 52, pp. 620, 621; *abs. in Internat. Inst. Agr. [Rome], Mo. Bul. Agr. Intel. and Plant Diseases*, 5 (1914), No. 6, p. 777).—It is stated that in many districts of Hungary the disease is fairly frequent and that it attacks some herds every year, sometimes causing considerable loss. This is said to be especially true of districts on the right bank of the Danube where the author has observed it to be one of the most frequent diseases of suckling pigs. Protective inoculations with cowpox lymph gave good results in several localities on about 400 young pigs.

The use of atoxyl in equine influenza, M. STANGE and SZULEWSKY (*Berlin. Tierärztl. Wchnschr.*, 30 (1914), No. 28, pp. 496, 497; *abs. in Vet. Rec.*, 27 (1914), No. 1359, p. 62).—Atoxyl was used with success during a severe and extended outbreak of influenza in army horses in which the catarrhal and pectoral forms of the disease occurred simultaneously.

All of 84 cases of pectoral influenza with severe general symptoms that were treated by intravenous injections of from 0.3 to 0.4 gm. of atoxyl, without the previous use of other agents, recovered, whereas three other cases of like severity treated symptomatically as controls all died of pulmonary gangrene. As a rule a single dose of from 0.3 to 0.4 gm. was sufficient to arrest the pathological process and stimulate the absorption of the exudate. In rare cases the same dose had to be repeated the next day or later. The most favorable effect was observed when the atoxyl was used on the fourth or fifth day of the illness, when the temperature was high.

It is pointed out that atoxyl is much cheaper than salvarsan and its use does not require so difficult a manipulation. The authors, therefore, recommend atoxyl as a substitute for salvarsan.

The method in which fowl cholera immune serum acts, E. WEIL (*Arch. Hyg.*, 79 (1913), No. 2-3, pp. 59-71).—The purpose of this investigation, which is a continuation of the studies already noted (E. S. R., 30, p. 186), was to determine the time in which the protective properties of the serum set in, and, furthermore, to establish why immune substances must remain in the blood for a time in order to protect the animal.

The results show that immune serum pretreated with bacteria does not protect against intraperitoneal infection with virulent bacteria. On the other hand, if the bacterial injection is made some two hours later (also after five to nine hours), the death of the animal does not result. The amount of serum given and the infecting dose have a great influence upon the time of protection. The time factor is not believed to be dependent upon the resorp-

tion of immune sera, nor do leucocytes seem to take a part in the process except that they may inhibit the multiplication of the bacteria.

Sulphocarbolates in the treatment of white diarrhea (bacillary form) of young chicks, G. D. HORTON (*Amer. Vet. Rev.*, 46 (1914), No. 3, pp. 321, 322).—In experiments conducted by the author at the Oregon Agricultural College in which a total of 50 chicks received the sulphocarbolate treatment, as recommended by Kaupp in the work previously noted (*E. S. R.*, 31, p. 88), only seven of those thus treated remained alive at the end of ten weeks. "From the manner in which the chicks died off and from the general appearance of the seven that remained alive it seems evident that sulphocarbolates in the treatment of white diarrhea (bacillary form) have very little, if any, efficiency."

Diseases transmitted by ticks; their classification, treatment, and eradication, A. THEILER, C. E. GRAY, and W. M. POWER (*Amer. Vet. Rev.*, 46 (1914), No. 3, pp. 281-297).—This review of the subject was presented at the Tenth International Veterinary Congress, held at London in 1914.

RURAL ENGINEERING.

Concrete lining as applied to irrigation canals, S. FORTIER (*U. S. Dept. Agr. Bul.* 126 (1914), pp. 86, pls. 17, figs. 15).—This publication treats of the subject of concrete lining for irrigation canals from the standpoint of economy, design, and construction and is intended for the use of irrigation engineers and the managers and superintendents of irrigation systems.

The results of 321 sets of measurements of seepage made on different canals are summarized in the following table:

Summary of seepage measurements expressed in terms of percentage of total flow lost per mile of channel for various sized canals.

Capacity of canal.	Number of tests.	Average loss per mile.	Capacity of canal.	Number of tests.	Average loss per mile.
<i>Second-feet.</i>		<i>Per cent.</i>	<i>Second-feet.</i>		<i>Per cent.</i>
Less than 1.....	16	25.7	50 to 75.....	31	4.3
1 to 5.....	37	20.2	75 to 100.....	26	2.7
5 to 10.....	30	11.7	100 to 200.....	45	1.8
10 to 25.....	49	12.1	200 to 800.....	27	1.2
25 to 50.....	48	5.5	800 and over.....	14	1.0

It is concluded from these results that seepage is the most important source of loss from canals.

From the results of 76 measurements of flow of 18 canals it is concluded that the so-called coefficient of friction n is on an average larger than has usually been assumed by engineers. "The results show that only in rare cases, where conditions are more or less ideal, is one justified in assuming a value as low as 0.012 for n ."

The following values for n are given to serve as a guide in estimating the discharge of lined canals: (1) $n = 0.012$ for concrete-lined canals having a smooth sidewalk finish, clean bottom, no moss, uniform cross section, well-formed joints, long tangents, flat spiral curves, no perceptible undulations on the surface of the water, and in general the best construction and the best conditions obtainable in practice. (2) $n = 0.013$ for concrete-lined canals having conditions slightly better than those of type 3 and not so good as those of type 1. (3) $n = 0.014$ for concrete-lined canals having an unplastered or rough troweled surface, clean bottom, uniform cross section, well-formed joints, medium curvature,

no spirals, slight surface undulations, no aquatic vegetation, and in general good construction and favorable conditions. (4) $n = 0.015$ for concrete-lined canals having conditions similar to those of type 3, but with greater curvature and some débris or other retarding influences. (5) $n = 0.016$ for concrete-lined canals of average workmanship and medium conditions, having a rough surface, imperfect joints, and sharp curves; also for canals of smooth lining and good workmanship, but having one or more unfavorable conditions, such as sand and gravel in the bottom or projecting joints which decrease the velocity of water. (6) $n = 0.017$ for concrete-lined canals roughly coated, but otherwise in medium condition. (7) $n = 0.018$ for concrete-lined canals coated as in type 6 and having the bottom more or less covered with sand and gravel, or else a clean bottom but poor alignment, irregular cross section, broken gradient, or the like."

Reference is made to experiments with other kinds of lining, and the principal benefits to be derived from concrete lining are pointed out as conservation of seepage water, increase in carrying capacity of the canal, reduction of charge for operation and maintenance, and insurance against damage to crops.

As regards suitable grades, it is believed that a mean velocity of between 8 and 10 ft. per second is about as high as should be adopted in lining canals under ordinary conditions.

In locating a new canal for concrete lining, it is stated that sharp curves should be avoided if possible, but that the expense of excavation required to lessen curvature should be balanced against the disadvantages and extra cost of lining sharp curves. In discussing the effect of alkali on concrete lining, reference is made to previous studies of this nature (E. S. R., 29, p. 686), and it is stated that good practice in concrete lining construction where alkali must be reckoned with necessitates the following precautions: "(1) Do not use sand, gravel, or water containing alkali; (2) keep soil waters charged with alkali from coming into contact with the concrete by the use of suitable drainage; (3) give careful attention to the proper proportioning of materials and use more cement than is needed to fill the voids; (4) protect the surface by a thin plaster coat of dense mortar of granular sand; and (5) both the concrete and the mortar used for the lining may be dampproofed by the addition of 5 to 10 per cent of semiasphaltic oil when mixing the materials."

In summing up the results of experiments on the expansion and contraction of concrete, it is stated "that for concrete slab construction such as canal lining, where only one side is exposed and with the other side in contact with earth, a coefficient of expansion of 0.0000045 should be used, but in the case of concrete construction where all sides are subject to equal temperatures and are not under the conditions of moisture and earth contact found in canal lining and similar construction, a coefficient of 0.0000063 can be used with safety."

The importance of joints in concrete lining for canals is pointed out and various kinds of joints are described and illustrated. A final section gives data in which an effort has been made to show what constitutes current practice throughout the West in the lining of old and new canals.

Stream-gaging stations and publications relating to water resources 1885-1913, Parts I-V, compiled by B. D. Wood (*U. S. Geol. Survey, Water-Supply Paper 340* (1914), A, pp. 19+XII; B, pp. XIX+21-30; C, pp. XXII+31-42; D, pp. XX+43-52; E, pp. XXI+53-62).—In Part I, a list of publications relating specifically to the North Atlantic coast drainage basins is given, with a similar list of reports that are considered to be of general interest in many sections and which cover a wide range of hydrologic subjects. Brief references to reports published by state and other organizations are also given.

The remaining parts contain data similar to the above for other sections, as follows: Parts II, South Atlantic coast and Eastern Gulf of Mexico Drainage Basins; III, Ohio River Basin; IV, St. Lawrence River Basin; and V, Hudson Bay and Upper Mississippi River Drainage Basins.

A method of determining the daily discharge of rivers of variable slope, M. R. and W. E. HALL and C. H. PIERCE (*U. S. Geol. Survey, Water-Supply Paper 345-E (1914), pp. II+53-65, figs. 2*).—It is stated that the usual assumption, when estimating the daily discharge of a stream by means of a discharge rating curve, that the velocity and therefore the slope of the river surface remain constant for the same gage height, is not always true, and that in many streams, particularly those with very flat slopes, the variation in slope for the same gage height becomes so large as to affect seriously the accuracy of the method. Still greater variations are said to occur when flatness of slope is conjoined with discharge into a body of water subject to large fluctuations of surface elevation, as occurs in the lower Mississippi basin. For streams of this nature it is proposed to base the estimate of daily discharge on both the gage height and the slope determined for each day and at the time of each discharge measurement and to adjust the discharge values on the assumption that for the same gage height and conditions of channel the velocity will vary with the square root of the slope.

For this purpose the formula $Q_1 = Q_n \sqrt{\frac{H_1}{H_n}}$ is derived, in which Q_1 =actual discharge of a stream as determined by the current meter, H_1 =the corresponding difference in elevation of water surface between the two gages, and Q_n =a "normal" or theoretical value of the discharge for the "normal" or average gage height difference H_n .

"By means of discharge measurements the values of Q_1 may be determined for different gage heights; $\frac{H_1}{H_n}$ will be likely to vary with the different measurements and will be greater or less than unity according as the slope of the stream at the time of the measurement is greater or less than the average slope. The

values of Q_n as determined from the expression $Q_n = \frac{Q_1}{\sqrt{\frac{H_1}{H_n}}}$ will, however, give a well-defined curve when plotted in the same way as the ordinary discharge rating curve. The 'normal' discharge curve for Q_n having been determined, a 'normal' rating table is prepared from it in the ordinary way. To find the actual discharge of the stream at any stage and for any slope the 'normal' discharge is taken from the 'normal' rating table and multiplied by the proper value of $\sqrt{\frac{H_1}{H_n}}$."

An example of the practical application of the method is given.

The discharge of Yukon River at Eagle, Alaska, E. A. PORTER and R. W. DAVENPORT (*U. S. Geol. Survey, Water-Supply Paper 345-F (1914), pp. II+67-77, pls. 2, figs. 2*).—This paper describes the climatic conditions of the Yukon River basin and reports the results of measurements of flow made by means of floats. Observations made to determine the coefficient to be used in reducing surface velocity to mean velocity showed this coefficient to be 0.92. A comparison of run-off and precipitation in the basin indicates that the run-off was approximately 65 per cent of the precipitation for the three years of observation.

Profile surveys in Hood and Sandy River basins, Oregon (*U. S. Geol. Survey, Water-Supply Paper 348 (1914), pp. 8, pls. 6*).—This report, prepared under the direction of R. B. Marshall, describes the general features of the Hood and Sandy River drainage basins and gives plans and profiles of these rivers and some of their tributaries.

The water resources of Butte, Mont., O. E. MEINZER (*U. S. Geol. Survey, Water-Supply Paper 345-G (1914), pp. 79-125, pls. 3, figs. 4*).—This paper reports an investigation of the water resources of the upper Silverbow basin, an area of about 83,200 acres, with reference to the supply of ground water under the flat and the feasibility of developing it for industrial uses and for irrigation. The principal conclusions reached in this investigation are summarized as follows:

“The bedrock will yield enough water in some localities for domestic purposes but not enough for irrigation or industrial use. It has no artesian structure. The basin formed by the bedrock is partly filled with more or less porous deposits of clay, sand, and gravel, . . . which are saturated with water below the water table. In only small areas near the mountains does the water table lie more than 100 ft. below the surface; over a considerable part of the flat it lies less than 25 ft. below; and in the principal stream valleys it is nearly at the surface.

“The valley fill is incoherent and poorly assorted. To develop maximum yields, wells sunk into the fill should have casings perforated at the water-bearing beds with holes at least $\frac{1}{4}$ in. in diameter or width. . . . With proper methods of construction a yield of 100 gal. per minute from a single well can probably be developed in most parts of the flat. Flows with slight head are likely to be struck at any point . . . where the ground water is near the surface, but flows of large volume will probably not be found. . . . The quantity of water annually received by and discharged from the valley fill . . . is probably less than 10,000 acre-feet. A large part of this . . . could be recovered by pumping from wells. If, by heavy pumping or other agency, the water table is drawn down to a level below the floors of the principal stream valleys these streams will contribute more largely to the underground supply than they do at present. . . .

“The typical soil of the flat is of good physical constituency, rich in soluble minerals useful for plant growth, low in organic matter, and is slightly acid but can be improved by the application of lime and manure. The ground water is of satisfactory quality for irrigation. On account of the porous character of the subsoil, the duty of irrigation water will be rather low, and frequent applications of water will be necessary. A supply of 100 gal. per minute will, however, be sufficient for a 10-acre truck farm. The cost of developing ground-water supplies is high, but the cost of pumping is moderate, provided there is proper equipment and efficient management. The costs need not be prohibitive if intensive agriculture is practiced.”

Surface water supply of the United States, 1911.—VII, Lower Mississippi River basin, W. B. FREEMAN and H. J. DEAN (*U. S. Geol. Survey, Water-Supply Paper 307 (1913), pp. 90, pls. 4*).—This report presents the results of measurements of flow made on the lower Mississippi River basin during 1911.

Ground water for irrigation in the vicinity of Enid, Okla., A. T. SCHWENNESEN (*U. S. Geol. Survey, Water-Supply Paper 345-B (1914), pp. II+11-23, pl. 1*).—The first part of this report deals with the occurrence and distribution of ground water in the vicinity of Enid, Okla., and with the possibility of its development for irrigation and other purposes.

The water-bearing formations are described as the Carboniferous “red beds” and the Tertiary and later deposits. It is stated that in the agricultural district around Enid many of the domestic wells derive water from the red beds, all of which are shallow and tap the water-bearing sandstones interbedded with the predominating red shale. In most places one or more water-bearing sandstone beds may be reached by drilling less than 100 ft. Pumping tests of

a number of wells showed that the greatest yield recorded from any of them was 175 gal. a minute in a continuous 24-hour test.

It is stated that the more highly mineralized "red bed waters" are unsatisfactory for irrigation, but that many of these waters may be used without injury to plant growth. The well waters from the Tertiary deposits are said to be generally of good quality and are satisfactory for irrigation. A case is cited in which a well in this formation yields 200 gal. per minute continuously for 24 hours without an appreciable weakening of the supply. It is stated that in this area the cost of developing and pumping water from the red beds will be much greater than the cost of developing and pumping water from the Tertiary or younger sands and gravels. "The available supply of water in the Tertiary and later alluvial sands and gravels in the Enid region is probably not sufficient for the heavy irrigation of large tracts, but is large enough for the irrigation of many small tracts distributed over the area."

In a note on ground water for irrigation on the Great Plains, by O. E. Meinzer, it is stated that "with good management pumping for irrigation is now generally feasible where the water level stands within 25 or perhaps 50 ft. of the surface and for the irrigation of vegetables and fruit where the depth to water is even greater."

Ground water for irrigation in the valley of North Fork of Canadian River near Oklahoma City, Oklahoma, A. T. SCHWENNESEN (*U. S. Geol. Survey, Water-Supply Paper 345-D (1914), pp. II+41-51, pl. 1*).—This paper describes the geology of a valley having an average width of about $1\frac{1}{2}$ miles and an area of about 140 square miles, and reports on the occurrence, quantity, and distribution of its ground-water supplies.

The valley fill is said to be from 30 to 60 ft. deep, consisting of water-sorted clays, sands, and gravels, and water may be reached almost anywhere at depths of 15 to 30 ft. Bored wells are in most general use. Estimates on the yearly accretions to the ground-water supply show them to be equal to a layer of water 8 to 16 in. deep over the whole valley in average years and 4 to 8 in. in the driest years. Analyses of water from wells in the area show all of them to be satisfactory for irrigation. The irrigation of considerable areas of the land is considered feasible, but it is stated that prospective irrigators should be cautioned against making large outlays for pumping installations without first duly considering all the factors of cost that are involved.

Geology and underground waters of the southeastern part of the Texas coastal plain, A. DEUSSEN (*U. S. Geol. Survey, Water-Supply Paper 335 (1914), pp. 365, pls. 9, figs. 17*).—This report describes the underground water horizons of a region embracing an area of 36,317 square miles in east and northeast Texas, and discusses the artesian conditions and prospects in the several counties included in the area. The arrangement of the relatively pervious and impervious strata of the region is said to be such as to constitute five great artesian systems, according to the order of their superposition, each consisting of two confining impervious members between which is a porous water-logged member constituting an artesian reservoir.

"The [water] supplies of this area . . . vary widely in character and mineral content but in general may be called rather highly mineralized alkali waters, likely to foam badly in boilers and to cause trouble by alkali accumulation if used for irrigation. Though many wells furnish water too strong to be potable and some furnish water too hard to be used in cooking, most of the waters are drinkable and a large proportion of them can be used for all domestic purposes."

Underground water of Luna County, New Mexico, N. H. DARTON and A. T. SCHWENNESEN (*U. S. Geol. Survey, Water-Supply Paper 345-C (1914),*

pp. II+25-40, pl. 1).—This paper reports on the occurrence, distribution, and quantity of underground water of the area and deals with the possibility of its development for irrigation and other purposes.

"The thick body of sand and gravel underlying the wide bolsons of Luna County contains a very large volume of water, most of which is within 20 to 150 ft. of the surface. The depth and volume of water vary from place to place, but there are extensive areas in which the depth is not too great for profitable pumping and the volume is ample for irrigation." The deposits underlying the area are said to vary greatly in their water-holding capacity and to include many strata or beds of sand some of which attain locally a thickness of from 40 to 50 ft. The few deeper borings made are said to show relatively few beds of water-bearing sand below 200 ft.

The water from the wells in the county is in general considered to be of excellent quality, suited to all uses. There are about 280 wells of various kinds in the county, many of which are equipped with pumps capable of delivering from 500 to 1,500 gal. a minute. "At some of the ranches considerable irrigation has been done already, with very satisfactory results as to products and cost. The wells for this service are mostly from 100 to 200 ft. deep and have water from 20 to 50 ft. below the surface. Naphtha is the fuel at most of the plants, but crude oil has been employed at some and found much cheaper." Deep borings for artesian flows have not been satisfactory. The results of tests of five typical pumping plants in the county are given in tabular form showing the cost of distillate fuel used per acre foot of water per foot of lift to be in two cases 2 cts. and $2\frac{1}{2}$ cts. at average discharges per minute of 603 and 555 gal. and average total lifts of 73.6 ft. and 36.9 ft., respectively.

To what extent is irrigation practicable and profitable in Germany? GERLACH (*Landw. Centbl.*, Posen, No. 5 (1913); *abs. in Chem. Ztg.*, 38 (1914), No. 68, *Repert.*, p. 320).—It is stated that the profitable results from irrigating rye and potatoes in Germany are on the whole few. The total area of profitably irrigated lands in Germany is also relatively small, owing mainly to the scarcity and high price of water.

Road laws of Minnesota (*State Highway Com. Minn. Bul. 12* (1914), pp. 62).—The text of the laws is given.

Report of the State Highway Commission for 1912-13 (*Rpt. Highway Com. Minn., 1912-13*, pp. 36, pls. 2, figs. 16).—This report includes tabular data on the amount, kind, and cost of work done in the different counties of the State. Several illustrations of bad and improved road and bridge conditions are also given.

Rules and regulations for the maintenance of state roads, 1914, G. W. COOLEY (*State Highway Com. Minn. Bul. 13* (1914), pp. 3, figs. 2).—This pamphlet describes briefly the road patrol maintenance and road drag systems. Perspective views of the so-called Minnesota road planer or road drag are also given.

Stump-pulling machine for clearing land (*Engin. News*, 72 (1914), No. 13, pp. 642, 643, figs. 2).—A stump-pulling machine is described and illustrated which consists of a frame of 15-in. steel I beams mounted on a pair of longitudinal 9-in. I beams which form the runners. At the front end there is a steel A frame 16 ft. high to which are attached the guy lines of the 36-ft. boom. At the rear end is a double-cylinder 3-drum engine and a vertical boiler. The front drum carries the pulling cable and is geared for two speeds. For pulling a stump it exerts a pull of 145,000 lbs. with a speed of 30 ft. per minute, while for skidding or hauling in the stump it has a speed of 350 ft. per minute. The middle drum carries the piling line which is led over the boom, and the hoisting capacity is 10 tons.

It is claimed that this machine first hauls in and stacks or loads the trees and logs, then pulls the stumps, hauls them in, and stacks them ready to be burned. A tract of 5 acres is said to be clearable at one setting. On a piece of clearing done on heavy clay land with pine stumps from 10 to 40 in. in diameter and averaging 44 stumps per acre, the machine pulled, skidded, and piled about 110 stumps per day at a cost of about 28 cts. per stump, or \$12.32 per acre.

Report on fires occurring in threshing separators in eastern Washington during the summer of 1914, I. D. CARDIFF ET AL. (*Washington Sta. Bul.* 117 (1914), pp. 22).—Attention is called to the large number of fires which occurred in threshing separators during the threshing season of 1914 and extensive investigations as to the cause of such fires and their prevention are reported.

There was no significant distribution of the fires geographically or with reference to time of day. The season in question was unusually dry with low humidity and low soil moisture content, which conditions are said to have contributed to an unusually low moisture content in the grain and straw, thus increasing its combustibility and making it more easily broken up by the threshing machinery. The same dry condition was found to have also contributed to an increase in the normal amount of static electricity developed by the cylinder and other portions of the machinery.

Smut was found to be exceedingly inflammable owing to the fact that the individual spores are very small and contain from 4 to 5 per cent of oil. It was found in investigations upon the possibility of ignition of an air and smut mixture from electric sparks that a spark of static electricity very readily ignited the smut-air mixture, producing the same type of explosion as with a flame. This was possible even though the electric spark was rather small. It was also found that the amount of smut in wheat during the season was considerably above that of previous years.

It is thought reasonably certain, therefore, that the fires were caused by a combination of conditions, namely, an exceedingly dry season, an unusually large amount of smut, an increased amount of organic dust from broken grain and straw, an increased combustibility of both smut and dust, and an increased amount of static electricity.

As regards remedies, it is stated that fire can be greatly retarded by the use of so-called fireproof paints and caustic potash, and that, although too much reliance can not be placed upon them, fire extinguishers will aid in retarding a sudden fire. As preventive measures machine owners and farmers are strongly urged (1) to ground the cylinder of the separator by means of an electric brush connected by wire to an iron peg driven a foot or two into the ground, (2) to provide every machine with a system of water sprinklers, (3) to place a quantity of water in barrels or other receptacles near or upon the separator and provide buckets for its distribution in case of fire, (4) to break a couple of furrows around the setting before threshing is commenced, (5) to connect in all cases the separator with the engine by means of a strong cable, enabling it to be pulled away from the straw pile upon the outbreak of fire, and (6) to give the crew definite directions as to an organized method of procedure in case of fire.

Greenhouse construction, S. C. JOHNSTON (*Ontario Dept. Agr. Bul.* 224 (1914), pp. 29, figs. 20).—An investigation of greenhouse construction covering the principal vegetable growing districts of the northern and eastern United States is reported. The main results of the investigation may be summarized as follows:

The points to be considered in choosing the location and site for a greenhouse plant are the increased cost of production due to long hauls and re-handling, the value of good roads, the danger of low places, and the increased

fuel consumption when in the direct path of the prevailing winds. The foundations should be of concrete for permanence, as a rule 8 in. in thickness, and should be set in the ground at sufficient depth to give a good foundation and to be below the frost line. Some soils require drainage around the walls to prevent frost action. It is recommended on any house 30 ft. or over that the eaves be placed at least 6 ft. above the level of the surface soil. Houses running east and west and north and south give equally good results.

It is said to be more profitable on the whole to construct a greenhouse of wide span owing to the great amount of room available, better control of ventilation, reduced chance of disease, and lower cost of heating. The advantages ascribed to iron frame greenhouses are the small cost of upkeep, solidity, small cost to heat, small glass breakage, lack of columns, and minimum shade. The objection to this type of construction is its initial cost.

The greenhouse of pipe frame construction is considered an economical house for the man requiring only a small house to be used with raised benches, but with this form of construction in a house of any size so many supporting members are necessary that the ground in the house can not be easily cultivated with horses.

The merits of separate houses over joined houses are pointed out as the ease with which side ventilation may be secured, ease of temperature and heating control, and the small liability of the spread of disease. Raised benches are recommended for the small greenhouse grower and the solid beds for the commercial grower. As regards heating, the gravity system of hot water heating is recommended for small houses, while for larger houses some form of circulator is necessary. For long houses or for large houses or large ranges the use of steam for heating is considered advisable.

Experiments on the oxidation of sewage without the aid of filters, E. ARDERN and W. T. LOCKETT (*Jour. Soc. Chem. Indus.*, 33 (1914), No. 10, pp. 523-536, figs. 2).—Investigations with regard to the aeration of sewage showed that the resultant solid matter obtained by prolonged aeration, which has been termed activated sludge, has the property of enormously increasing the purification effected by simple aeration of sewage and greatly intensifies the oxidation process. The extent of the accelerating effect was found to depend upon the intimate manner in which the activated sludge is brought into contact with, and upon its proportion to, the sewage treated. To maintain the sludge at its highest efficiency it was necessary that there should not be at any time an accumulation of unoxidized sewage solids.

Temperature exerted a considerable influence on the oxidation process. The purification effected was seriously diminished at temperatures constantly below 10° C. (50° F.). Up to 20 to 24° no material difference in the clarification effect and general purification was observed, although nitrification proceeded more rapidly as the temperature rose. At higher temperatures the clarification effect was somewhat interfered with during the earlier period of aeration, with a consequent delay in the establishment of nitrification. Subsequently the rate of nitrification somewhat increased.

It is concluded "that under the conditions of experiment a well-oxidized effluent can be obtained by the aeration of average strength . . . sewage in contact with activated sludge for a period of from 6 to 9 hours. The percentage purification effected as measured by the usual tests is at least equal to that obtained by the treatment of sewage on efficient bacterial filters. The period of aeration naturally depends upon the strength of the sewage treated and the degree of purification required."

Sewage disposal in unsewered districts (*Minneapolis, Minn.: Bd. Health, [1914], pp. 15, figs. 8*).—This pamphlet deals briefly with the water carriage

system of sewage disposal, including toilet fixtures, house drainage system, the main drain or sewer, and the disposal or purification plant. Two types of plumbing systems are described, the vent system and the nonsiphon trap system. The second system, using nonsiphon traps and eliminating the vent stacks, is said to be cheaper than the vent system owing to the saving in material and labor. It is stated that the function of a septic tank is to prepare the sewage for disposal in the soil and that the sewage is not purified in the tank. In opposition to what has been the usual practice, it is stated that the main soil pipe from the house or building will serve to ventilate the septic tank and that there should be no house trap on this pipe.

RURAL ECONOMICS.

Rural improvement, F. A. WAUGH (*New York and London, 1914, pp. XIII+265, pls. 21, figs. 61*).—This book is written primarily from the landscape architect's point of view, and treats of the means of access, roads and streets, roadside trees, civic centers, public grounds, the village home garden, farm planning, community planning, rural architecture, improvement programs, and organization and management.

A rural life survey of Greene and Clermont counties, Ohio, P. L. VOGT ET AL. (*Miami [Ohio] Univ. Bul., 12. ser., No. 11 (1914), pp. 82, figs. 15*).—This bulletin describes the economic and social conditions in two counties in Ohio.

Among the conclusions reached by the author were that evidence exists that the country and particularly the villages are brought under the influence of neighboring cities, and for this reason the people of the country have a right through the state legislature to say what the moral influence of the city shall be in the same way that the State shall say what steps the city shall take to prevent physical contagion. He claims that there is evidence that both the country and village are still lacking in provision for wholesale amusement for their boys and girls. When adequate pure recreations are provided, the saloon and vice resorts of neighboring cities will exert less influence, and the village and rural community will be on a much higher plane of social life than at present.

Community service week in North Carolina (*Raleigh, 1914, pp. 86, figs. 9*).—This pamphlet contains suggestions for improving rural conditions along the lines of public roads, grounds, buildings, schools, and neighborhoods, and gives a number of test questions attempting to call attention to the deficiencies commonly found in rural communities. There are also a number of questions to test the progress that the individual county has made.

Rural life conference (*Alumni Bul. Univ. Va., 3. ser., 7 (1914), No. 4, pp. 443-552, pl. 1, figs. 5*).—Among the topics discussed at this conference were the religious forces at work in country life and the educational opportunities of the country church, by W. E. Garner; the public school and rural life, by H. F. Cope; and women's service to the community, by Anna B. Taft.

The rural church movement, E. L. EARP (*New York and Cincinnati, 1914, pp. 177, pl. 1*).—The author believes that the problem of spiritual leadership is the most important factor in the country life problem. He has attempted to select out of the history of the movement those outstanding facts and methods that have been of value and apply them to the conditions in rural life the church is now facing, showing those to be adapted to new plans, and those no longer useful and to be discarded.

The farm bureau movement in New York State, M. C. BURRITT (*N. Y. Dept. Agr. Circ. 93 (1914), pp. 38*).—This circular gives a brief history of the development of the farm bureau idea in the United States and especially in

New York and a detailed description of the work of three county agricultural agents in the State.

Opportunities in agriculture for women, E. B. BABCOCK (*Univ. Cal. Jour. Agr.*, 2 (1914), No. 1, pp. 17-22).—The author notes the organization of The Women's Agricultural and Horticultural International Union at the quinquennial meeting of the International Council for Women held in London in 1899, outlines the objects of the union, and gives the replies to inquiries sent to a few women in California as to the necessity of a special course in agriculture, either in a college or an agricultural school for women who plan to follow an agricultural pursuit, and as to the amount of capital and land desirable for various farming enterprises.

Opportunities for women in agriculture, ELEANOR MARTIN (*Women's Ed. and Indus. Union, Boston, Studies Econ. Relations Women*, 1 (1914), pt. 2, pp. 3-69).—The author concludes, from a study of the conditions in Massachusetts, that a girl can not become a wage earner in agricultural pursuits and that to succeed at all as a farmer she must begin with at least a small property or capital for investment. However, she believes that the education of the girl on the farm, or in rural regions through the school in cooperation with the home, may enable her to take up such subjects as horticulture, floriculture, poultry raising, and beekeeping and make them her vocation in later life. The school instruction and the experience in the home should be coordinated.

The American Farm Management Association (*Amer. Farm Management Assoc. Proc.*, 4 (1913), pp. 130, figs. 4).—Among the subjects discussed at this annual meeting were field and laboratory courses and classroom work in farm management, the survey method of determining cost of production, farm records as a basis of increasing farm profits and improving farm management, marketing, and contracts between landlord and tenant.

An outline for the study of current political, economic, and social problems (*Ind. Univ. Bul.* 12 (1914), No. 7, pp. 77).—This outline consists principally of a classified bibliography, and contains the following subheads relating to rural conditions: Township and rural communities, agricultural credit, taxation of land values, and rural schools.

The political and sectional influence of the public lands, 1828-1842, R. G. WELLINGTON (*Brookings, S. Dak.*, 1914, pp. 131, pls. 3).—The author traces with great detail the discussion of the public land question in Congress during this period, and its influence upon various economic measures and upon the political fortunes of sectional presidential candidates.

The influence of the passing of the public lands, W. J. TRIMBLE (*Atlantic Mo.*, 113 (1914), No. 2, pp. 755-767).—The primary result of the swift settling of public lands in the United States was the enormously increased production of the necessities of life. With the productive lands taken up, the law of diminishing lands begins to operate to make increase in production more difficult. Among the other effects of the passing of public lands are the rapid rise in farm values, increase in farm tenantry, and smaller opportunities for the individual to rise out of his class. The author states that the possession of a farm of from 80 to 320 acres, with the expensive equipment now required to run it, is quite out of the reach of a large number of our population at present prices, and it is difficult to avoid the conclusion that even in the country social stratification is proceeding by insensible and natural steps. The tendencies toward economic and social equality which were marked features of the public-land area therefore seem fast vanishing into history.

Vacant public lands in the United States (*U. S. Dept. Int., Gen. Land Off. Circ.* 335 (1914), pp. 24).—This circular contains a list of vacant government lands by counties, with their location and area, together with a brief description regarding their character. The report indicates that there were on July 1,

1914, over 290,000,000 acres of vacant land of which 175,000,000 was surveyed. The greater portion of this land was located in Nevada, Arizona, Utah, and New Mexico.

List of farms for sale (*Putnam, Conn.: Bd. Agr., 1914, pp. 168, figs. 25*).—This report contains a compilation of the farms in Connecticut offered for sale and gives a detailed description of land, buildings, water supply, and distances from railroad station, post office, and churches, together with the price asked.

An investigation of the profitableness of moor culture, W. FRECKMANN and SOBOTTA (*Landw. Jahrb., 46 (1914), No. 2, pp. 275-326, figs. 2*).—The authors discuss the cost of preparing moor land for cultivation and its profitableness under different agricultural practices.

Report on migration from rural districts in England and Wales (*Bd. Agr. and Fisheries [London], Rpt. Migration from Rural Districts in England and Wales, 1913, pp. 33*).—The author, by means of a questionnaire, attempted to determine the deficiencies and the supply of rural labor in different districts, and has classified his findings under the headings of employment in agriculture and the supply of agricultural labor; the extent, cause, and direction of migration; special instances of migrations; and general observations. The report gives details for individual counties.

Partnership in agriculture between landlord and tenant, R. PAGET (*Rpt. Brit. Assoc. Adv. Sci., 1913, pp. 778-782*).—The author outlines a scheme whereby the tenant and landlord can carry on farm operations by means of a partnership and gives a model agreement.

Contract between landlord and tenant, O. G. LLOYD (*Amer. Farm Management Assoc. Proc., 4 (1913), pp. 98-116*).—The author outlines what various authors have published in this field and what he considers the important phases of the problem, and gives a detailed account of an investigation of farm tenantry in Iowa with reference to the details of the contract between landlord and tenant.

He concludes that the farm would be more productive, better improved, and its fertility more likely conserved if partnership renting were encouraged. Inexperienced tenants with little credit and capital would be furnished the necessary equipment and supervision to operate the farm more efficiently. "The landlord will be more happy and a more progressive citizen if he remains actively engaged in the business that has made him what he is—an authority on agricultural conditions in his community. Partnership renting aids in solving many of the difficulties of the community as well as the difficulties of the farm."

Age of farmers, by color of operator, character of tenure, and size of farm (*Bur. of the Census [U. S.] Bul. Agr., U. S., 1910, Age of Farmers, pp. 35*).—This bulletin is the first attempt made to analyze the relationship existing between age of farmers, color and nativity of farm operators, size of farm, and character of tenure. The data are shown by sections, geographic divisions, and States.

For the United States as a whole 6.59 per cent of all the farmers were under 24 years of age, 22.22 per cent between 25 and 34 years, 24.71 per cent between 35 and 44 years, 22.52 per cent between 45 and 54 years, 14.89 per cent between 55 and 65 years, and 8.72 per cent 65 years and over. As the age increases the proportion of tenants decreases and the proportion of owners increases. The data also seem to indicate that the older farmers own the larger farms and that a large number of farmers retire to small farms late in life.

The rural credit system from the viewpoint of the farmer, G. N. LAUMAN (*Off. Yearbook Nebr. Farmers Cong., 1914, pp. 68-71*).—The author believes that the American farmer needs a land title registration law, a fundamentally

sound cooperation law, and a cooperative land mortgage bank if he is to obtain the credit that is due him.

Agricultural credit in Ireland (*Dept. Agr. and Tech. Instr. Ireland Jour.*, 14 (1914), No. 4, pp. 641-657).—This article gives an extensive review of the report previously noted (E. S. R., 32, p. 286).

A credit union primer, A. H. HAM and L. G. ROBINSON (*New York, 1914*, pp. III+79, figs. 10).—This pamphlet contains a large number of questions relating to credit unions, together with answers, model book forms, organization certificates, and by-laws, and the text of the New York credit union law.

The cooperative people's bank, A. DESJARDINS (*New York, 1914*, pp. 42, pl. 1).—The author calls attention to some of the characteristics that should be fundamental to people's banks. He claims that these banks should be organized to produce thrift among their constituents and not to make large profits, and shows how the cooperative people's banks in various countries and especially the La Caisse Populaire have been organized with this idea in view.

Inland boat service: Freight rates on farm products and time of transit on inland waterways in the United States, F. ANDREWS (*U. S. Dept. Agr. Bul.* 74 (1914), pp. 36).—The purpose of this inquiry was to collect information relative to freight rates and the time of transit of farm products carried on the inland waterways of the United States. It discusses the advantages of rail over river transportation and of river over rail, describes the terminals and landings and a number of typical steamboat routes of the Atlantic coast, Mississippi Valley, and Pacific coast, and gives other data.

The bulletin points out that the freight rates vary greatly in form, and most of the traffic is local in nature. Some characteristics of steamboat freight rates and the freight tariff zones are described. Tables are included showing receipts of various farm products by water compared with total receipts at selected cities, freight rates by boats on various farm products for September and October, 1912, and comparison of freight rates by water and by rail over selected routes for the same months.

Census of the Union of South Africa, 1911 (*Census Union So. Africa Rpt. 1911*, pp. 189, pls. 3).—This report consists of a general summary, and data relating to urban and rural population, live stock, agriculture, and special industries.

Agricultural statistics of Scotland (*Agr. Statis. Scotland*, 2 (1913), pts. 1, pp. 110; 2, pp. 113-186, fig. 1).—These reports give for 1913, with comparative data for earlier years, the acreage, average yield, and total production of farm crops, the area devoted to different agricultural purposes, number of live stock, and number of holdings by sizes.

AGRICULTURAL EDUCATION.

Better rural schools, G. H. BETTS and O. E. HALL (*Indianapolis, Ind., 1914*, pp. [20]+512, pls. 26, figs. 14).—In this book the authors discuss the demand for better rural schools, the curriculum, teacher, consolidation and efficiency, the administration of rural schools, and the outlook for rural education. Each chapter is followed by a series of questions for teachers' discussion and study and almost one quarter of the chapters are given over to everyday problems that concern the teacher in the schoolroom.

In a chapter devoted to vocational education the authors hold that the rural school should be made a vocational school, including in its curriculum practical or applied instruction in agriculture and the industrial arts to afford the point of contact between the school work and the home life interests and shape the mode of approach to all other subjects of study. Two types of home-project study, the progress of the agricultural club movement, and the influence of the

vocational school on the pupils are discussed. A bibliography on rural life and the rural school is appended.

Agricultural education in the public schools [of Ohio], L. S. IVINS (*Agr. Student*, 21 (1914), No. 1, pp. 56-58, fig. 1).—The author reviews the development of agricultural education in the public schools of Ohio and indicates some of its influences.

A new agricultural school for New Brunswick, R. NEWTON (*Agr. Gaz. Canada*, 1 (1914), No. 6, pp. 449-453, figs. 4).—This article contains a description of the building, equipment, and instruction of the first school of agriculture established in the Province of New Brunswick, at Woodstock.

Demonstrations in fruit packing (*Agr. Gaz. Canada*, 1 (1914), No. 9, pp. 730-737, figs. 3).—Reports are given on instruction in fruit packing in Prince Edward Island by T. Ross, Nova Scotia by P. J. Shaw, New Brunswick by R. P. Gorham, Quebec by J. H. Lavoie, Ontario by P. W. Hodgetts, and British Columbia by R. M. Winslow.

The Ontario Agricultural College and Experimental Farm, S. H. GANDIER (*Agr. Gaz. Canada*, 1 (1914), No. 9, pp. 702-709, figs. 4).—An account is given of the organization, buildings and equipment, instruction, and experimental work of the institution.

Handbook of women's institutes with report of advisory board (*Brit. Columbia, Dept. Agr. Bul. 54* [1914], pp. 208, pls. 7).—This bulletin contains the proceedings of the Conference of Women's Institutes of Vancouver Island, June 5 and 6, 1913, at Victoria, and of the Conference of the Lower Mainland Women's Institutes, June 12 and 13, 1913, at Chilliwack, including the papers read, institute statistics, reports of lecturers, some programs of women's institutes regular meetings, lectures delivered by institute lecturers in 1912-1913, reports, etc.

Agricultural education and school statistics in Prussia for 1909, 1910, and 1911 (*Landw. Unterrichtsw. Königr. Preuss., 1909-1911*, pp. XIX+692, pls. 2).—This report contains an account of the historical development and organization of the various phases of agricultural instruction in Prussia and a detailed statement concerning the organization, courses of study, attendance, etc., for 1909, 1910, and 1911, of the individual agricultural education institutions in Prussia, as well as of the itinerant instructors, agricultural house-keeping schools, special courses for adults, rural continuation instruction, and normal schools for the training of teachers of agriculture.

[Agricultural and forestry instruction in Austria and Germany], R. MILTNER and E. VITAL (*Land u. Forstw. Unterrichts Ztg.*, 28 (1914), No. 2, pp. IV+103-202+LXX).—This issue contains two special articles noted below; statistics of the 229 agricultural and forestry education institutions in Austria in 1913-14; new regulations for entering the Bavarian State Forest Service; a review of agricultural and home economics literature; miscellaneous notes; and an appendix giving the organization lists of the faculties of the agricultural education institutions in Austria.

Agriculture in Norway in 1914 (*Offentl. Landbruksv. Norge*, 1914, pp. VII-432).—This is a report on the work of the various governmental agencies for the encouragement of agriculture, including the experiment and control stations; dairy and cheese making schools, horticultural schools, agricultural schools, and home economics schools, and agricultural societies, the agricultural budget, and other data.

Report of the department of agriculture of Norway, 1913 (*Aarsber. Offentl. Foranst. Landbr. Fremme*, 1913, III, Statsföranst., pp. LXXXIV+885, figs. 42).—This report comprises a comprehensive survey of the work of the various government agencies established for the advancement of Norwegian agriculture and its various branches, including the annual reports of the state

agricultural experiment stations, chemical, seed, and milk control stations, horticultural and dairy schools, itinerant instructors, etc.

Agriculture in New Zealand high schools (*Agr. Gaz. Canada*, 1 (1914), No. 6, pp. 504, 505).—A brief account is given of the instruction in agriculture, including experimental work, in New Zealand high schools.

Agricultural commerce as a subject of instruction in the various grades of agricultural education, A. OSTERMAYER (*Land u. Forstw. Unterrichts Ztg.*, 28 (1914), No. 2, pp. 103–112).—In view of the fact that farming has developed into a commercial enterprise, the author discusses the necessity of introducing commercial instruction into the various grades of agricultural education, and outlines the subject-matter for collegiate instruction in this subject. In the Agricultural High School of Vienna the last semester of the course is devoted to agricultural commerce, including lectures 3 hours a week and seminars 2 hours, or a total of 60 hours, which the author considers a minimum requirement. Adaptation of this subject-matter to secondary and elementary agricultural schools is also discussed. In the author's opinion 2 hours a week during one semester or about 40 hours in the secondary school and 1 hour a week during a semester or during a course in the winter school, a total of about 20 hours, would be sufficient. He suggests that special attention be given to practical instruction, that instructors keep in close touch with commercial practice by participating in cooperative organizations, etc., and that a course of instruction in agricultural commerce be organized at the Agricultural High School of Vienna for the training of instructors in farm management in this subject to comprise from 36 to 40 hours of instruction.

Farm management, A. E. B. FIELDING (*London*, [1914], pp. VIII+108).—The object of this book is to give farm pupils, farmers' sons, and others commencing the study of agriculture a clear conception of the manner in which a farm is organized. It discusses the different systems of farming, the selection of a farm on which to learn and how to gain experience, the different crops and their relation to the live stock kept, cultural methods, care of live stock, and feeds and feeding.

Practicums for farm students, A. ROSAM (*Land u. Forstw. Unterrichts Ztg.*, 28 (1914), No. 2, pp. 113–120, fig. 1).—The author describes practical exercises in judging dairy cows, computing rations, seed selection and collection, preparation of a pocket herbarium, modeling plants and animals, and the preparation of diagrams showing the composition of foods, feeding stuffs, raw materials used in commerce, and commercial fertilizers and their rational application, which have given satisfactory results at the Farm and Dairy School in Pilsen, Austria.

Botany in the agricultural college, E. B. COPELAND (*Science*, n. ser., 40 (1914), No. 1029, pp. 401–405).—The author describes the year's course in physiology required of all students in the college of agriculture of the University of the Philippines before they are admitted to the study of agriculture itself, and discusses the teaching of botany in American agricultural colleges, as noted editorially (*E. S. R.*, 31, p. 701).

Crop production, C. M. WEED and W. E. RILEY (*Boston, New York, and Chicago*, 1914, pp. VI+246, figs. 129).—This school text, which gives essential facts concerning the characteristics, history, culture, varieties, and enemies of vegetable, flower, fruit, and farm crops, is an application of the project method to the study of crop production. It furnishes a series of simple outlines for each pupil to work out before taking up the study of the text, thus enabling the pupil to visualize the latter. An appendix contains suggestions for the teacher on starting seeds indoors, making flower borders, home vegetable gardens, seed testing apparatus, planting in the schoolroom, and identification of specimens.

Productive orcharding, F. C. SEARS (*Philadelphia and London, 1914*, pp. XIV+315, pl. 1, figs. 155).—This is a text on modern methods of growing, picking, handling, storing, grading, packing, marketing, and advertising fruit, including laws affecting orcharding. It is designed for the needs of college and short course classes and is the result of the author's experience in managing a relatively large orchard.

Home economics courses as they are being arranged in modern high schools, HELEN GRANT (*School Sci. and Math., 14 (1914), No. 7*, pp. 614, 615).—The author outlines the subject-matter of the four-year course in home economics in the Minneapolis high schools, which includes two years of work in sewing and applied art and two in cooking and applied science, the sewing and cooking alternating by semesters.

Domestic science principles and application, PEARL L. BAILEY (*St. Paul, Minn., 1914*, pp. XVI+343+14, figs. 44).—This text-book is arranged for schools having a two-year course in domestic science. It endeavors to present the fundamental principles together with their application in a simple natural sequence from the simpler food materials to the more complex combinations. The book also contains lessons on digestion and its relation to cookery, dietaries and planning menus, waitress work, school lunches and the working plans in use in schools, home management and household accounts, invalid cookery, emergencies and first aid, list of equipment necessary for the course, and score cards for judging cookery.

Demonstration lectures in domestic science (foods and cooking), sewing, and home nursing (*Ontario Dept. Agr. Bul. 215 (1913), pp. 19, figs. 5*).—Brief outlines and descriptions of the courses are given, with a summary of the work accomplished.

Principles of cooking, EMMA CONLEY (*New York, Cincinnati, Chicago, 1914*, pp. 206, pl. 1, figs. 42).—This text-book in cooking and elementary food study is intended for secondary and vocational schools. It contains general directions for work; a list of equipment of a school kitchen for a class of 16 pupils; a study of the different classes of foods and the principles of cooking and their application in practical lessons, tables showing the composition of common foods; and suggestions to teachers for teaching cooking in rural schools, including references.

Nature-study and the teacher, or the point of view in nature-study, J. VADEN (*Nature-Study Rev., 10 (1914), No. 6*, pp. 213-218).—For the benefit of teachers with little or no experience the author outlines a method of teaching nature study.

The out-of-doors indoors in the fall, HELEN M. REYNOLDS (*Nature-Study Rev., 10 (1914), No. 6*, pp. 223-234).—This article shows what can be done in teaching nature study in the elementary grades in the fall and gives an outline suggesting the organization of topics and their progression from grade to grade.

[**Industrial clubs and contests for Oregon boys and girls**] (*Oreg. Agr. Col. Buls., 1914, Nos. 113, pp. 4, figs. 2; 114, pp. 4; 115, pp. 11; 116, pp. 4; 117, pp. 7, figs. 3; 119, pp. 4, figs. 2; 122, p. 1; 127, pp. 7, fig. 1; 132, p. 1; 135, pp. 5; 138, pp. 2; 140, pp. 4; 142, pp. 4; 151, pp. 8, figs. 3; 153, pp. 3; 154, pp. 4, figs. 3; 155, pp. 11, figs. 2; 162, pp. 11, figs. 4*).—These bulletins consist of project studies in sewing, starchy foods, selecting and caring for poultry, feeding and care of dairy cows, feeding for pork and for show, creamed soups and vegetables, fruit and vegetable canning, planning, cultivating, and caring for the garden, instruction in manual arts, bread making, judging hogs, and directions for making project reports and methods of determining prize winners in corn growing, poultry raising, and pig feeding contests.

NOTES.

Alabama College and Station.—C. S. McDowell, Jr., of Eufaula, W. H. Oates, of Mobile, and T. D. Samford, of Opelika, have been appointed to the board of trustees, vice H. L. Martin, J. S. Fraser, and R. B. Barnes. F. L. Thomas, Ph. D. (Massachusetts College, 1914) has been appointed field assistant in entomology, vice G. W. Ells, resigned.

The extension service cooperated during February and the early part of March in a diversification campaign conducted by the extension service of a manufacturer of agricultural machinery, under the auspices of the chambers of commerce of the principal cities of Alabama.

Arizona University.—J. A. Armstrong, farm advisor for San Diego County, California, has been appointed farm advisor for Maricopa County, beginning March 1.

Arkansas University and Station.—H. E. Dvorachek, associate professor of animal husbandry at the Colorado College, has been appointed professor of animal husbandry in the college of agriculture and animal husbandman in the station beginning about February 1. F. E. Anderson has been appointed assistant in extension work.

California University and Station.—An initiative measure providing for a bond issue of \$1,800,000 for buildings was accepted by the voters of the State at the recent election.

According to a note in the *Pacific Rural Press*, the citrus substation is to be located at Riverside where a site of 477 acres with water rights has been acquired at a cost of \$55,000. Improvements costing \$120,000 are contemplated. Dr. H. J. Webber is to be in charge of the new substation and will inaugurate a soil survey, install an irrigation system, and begin planting.

Georgia College and Station.—John A. Gaston, of Greenville, has been appointed to the board of trustees of the college, vice J. A. Thrash, deceased.

R. C. Neely and J. W. Andrews have been reappointed to the board of trustees of the station for a term of five years beginning January 5. The board is planning to hold an open meeting in April for the purpose of bringing prominently to the attention of the state officials and others the work and needs of the station.

Hawaii College.—The college has added to its curriculum a 4-year course in sugar technology leading to the degree of B. S. During the vacation period between the third and fourth years, it is intended that the student will spend at least eight weeks on a plantation, either in the field or in the laboratory. Arrangements are also being made whereby during the second semester of the fourth year students may serve a sort of special apprenticeship on one or more of the plantations near Honolulu, performing the various duties and spending several weeks or more if necessary in each department.

Illinois University.—*Nature* notes that the university has given \$500 to the fund for the erection of a laboratory at Rothamsted in commemoration of the centenary of the birth of Sir John Lawes (1814) and Sir Henry Gilbert (1817).

Iowa College and Station.—The college is offering for the first time a correspondence course of 90 lessons in farm plants and soils for teachers. A correspondence course of 80 lessons in farm animals will be ready about April 1, one in home economics about July 1, and special courses in farm crops, soils, horticulture, animal husbandry, dairying, poultry raising, and home economics will be offered in the fall to teachers desiring advanced correspondence work.

M. E. Sar has resigned as assistant in the soil survey and has been succeeded by Knute Espe (1915). S. C. Guernsey has resigned as assistant in chemistry.

Kansas College and Station.—It is reported that over two-thirds of the 1914 graduates in animal husbandry took up farming and that many of the remainder are engaged in teaching or experimental station work.

Over 400 students were enrolled in the short courses, 216 being in agriculture, 110 in home economics, and 82 in the new 10 weeks' courses in cement and concrete construction, shop work, road building, irrigation and drainage, and steam and gas traction engines.

Walter L. Latshaw has been appointed assistant in soil analysis in the station.

Kentucky Station.—E. W. Mumma, assistant in charge of hog cholera serum production, died December 4, 1914. H. B. Hendrick, agronomist in the extension department, resigned January 1 to accept an appointment with the Agricultural Education Service of this Department. E. F. Worthington, inspector in dairy sanitation in the food and drug department, also resigned January 1. W. H. Simmons has been appointed assistant in the hog cholera serum laboratory, beginning December 1, 1914.

Louisiana University.—A new dairy barn of modern construction has recently been completed.

Massachusetts College and Station.—A plan recently approved by the faculty for submission to the board of trustees contemplates the offering of college courses the entire year. Under this plan, practical courses in agriculture and horticulture would be offered during the summer months for which college credit would be given. One advantage expected would be the completion of the college course about April 1 instead of in June as at present, the former being considered a more favorable time for graduates to secure employment.

Charles E. Ward, of Buckland, a member of the board of trustees and of its committee on the station, has resigned and has been succeeded by Edmund Mortimer of Grafton. P. J. Anderson, Ph. D. (Cornell, 1914), formerly field pathologist with the Pennsylvania Chestnut Blight Commission, has been appointed instructor in botany. H. J. Baker, field agent in farm management, has resigned to become head of the extension department at the Connecticut College. F. H. H. Van Suchtelen, Ph. D., associate professor of microbiology, and George E. Gage, Ph. D., associate professor of animal pathology, have been added to the station staff as soil microbiologist and animal pathologist, respectively.

Minnesota University.—A new course under the supervision of the division of agricultural education has been introduced in the school of agriculture for the graduates of the school desiring to prepare themselves to teach agriculture in the rural schools. The course will consist of two years' work in selected subjects, with special emphasis on agriculture and home economics.

The extension division is conducting a state-wide bread-making test with 1,600 enrolled. The loaves are sent to the college by parcel post and judged by the home economics department. Instruction is also being given in canning vegetables. Over 3,100 boys were enrolled in the boys' acre-yield corn contest.

Mississippi College and Station.—E. R. Lloyd, director of the station, was appointed director of the extension work, December 1, 1914, and J. R. Ricks, the station agronomist, was made vice-director of the station. Dr. H. B.

Brown, previously professor of botany and forestry, and botanists in the station, has succeeded E. C. Ewing, resigned, as the head of the department of cotton breeding. A. Smith, who had charge of the station beef cattle work, resigned December 1. E. Barnett, formerly of the South Carolina College and Station, has been appointed animal husbandman.

Missouri University.—Farmers' week was held at the university beginning January 11, in cooperation with the State Board of Agriculture. Over 2,800 people were enrolled in the farmers' short course, an increase of 572 over the previous year.

Benj. F. Geisert (Missouri, 1914) has been appointed assistant in agricultural extension.

Nevada University and Station.—Dr. H. E. Reid has been succeeded on the board of control by Dr. J. J. Sullivan of Virginia City.

A study of the poison parsnip has been completed and its poisonous principle isolated.

Public appreciation of the work of the station has been developing rapidly of late, especially in connection with the increased attention to bacteriology and veterinary science. These are of immediate interest to the stock raising interests of the State, which constitute the most important phase of its agriculture, and a reorganization of the station work is being effected which will further concentrate its activities along these lines.

New Mexico Station.—Francis E. Lester and M. O. Llewellyn have resigned from the board of regents and have been succeeded by J. A. Mahoney of Deming and C. W. Gerber of Las Cruces. W. T. Conway has discontinued the teaching of agricultural subjects in the college to devote his entire time to the boys' and girls' club work in the State.

Cornell University.—J. B. Bain has resigned as instructor in animal husbandry to accept a position with the Dairy Division of this Department.

North Dakota College.—A new dairy building has recently been completed. This is a two-story fireproof structure 84 by 52 feet, so arranged as to permit of future symmetrical enlargement if desired. It includes a room for the study of farm dairy practice, a creamery factory room for commercial operations, a room for cheese and ice-cream manufacture and market milk handling, a testing laboratory for 70 students, two classrooms, a reading room, and four cold storage rooms.

Ohio State University and Station.—The new horticultural and forestry building was dedicated February 5. Addresses were made by W. Paddock and W. R. Lazenby of the college of agriculture, S. A. Beach, of the Iowa College, and F. W. Rane, state forester of Massachusetts. The building is a two-story and basement fireproof structure of gray pressed brick, 250 by 60 feet, and in general appearance is similar to Townshend Hall, the agricultural building.

About 1,500 were registered in the recent farmers' week courses, an increase of about 80 per cent over the previous year. On February 15 the county agent work was formally transferred from the station, where it had been developed, to the college of agriculture in harmony with the provisions of the Smith-Lever Act.

Oklahoma College and Station.—R. C. Potts, professor of dairy husbandry, resigned February 1 to accept a position with the Office of Markets and Rural Organization of this Department.

Oregon College and Station.—The annual short course, offering 100 courses in agriculture, engineering, and home economics, was held January 4 to 30.

The first session of farmers' week, held February 1 to 6 under the auspices of the extension division, was attended by over 2,000 persons, mostly farmers and housewives. The program included exhibits, demonstrations, and lectures,

and 20 conferences on subjects relating to rural life in Oregon in which most of the live stock associations, educational bodies, and women's clubs of the State participated.

Dean Henrietta W. Calvin, of the school of home economics, has resigned to become specialist in home economics in the United States Bureau of Education, beginning in March.

Seedsmen and buyers have been notified that the new state pure seed law went into full effect January 1. The state dairy and food commissioner is responsible for the enforcement of the law under the direction of the state seed board, of which H. D. Scudder, agronomist of the college and station, is chairman.

Pennsylvania College.—Over 500 persons attended the farmers' week held from December 28 to January 2. More than 150 lectures and demonstrations were offered.

Porto Rico Federal Station.—George L. Fawcett, plant pathologist, has resigned to accept a similar position in the experiment station at Tucuman, Argentina.

Rhode Island Station.—Philip H. Wessels, formerly assistant in chemistry, has been made associate in chemistry.

Tennessee University and Station.—The county court unanimously authorized on January 4 a county bond issue of not to exceed \$125,000 for the purchase of a tract of 569 acres as an addition to the university farm. If this action is ratified by the legislature, the property will be acquired and transferred to the State for the use of the station.

The Second Annual Midwinter Fat Stock Show was held at the station farm January 25-30. The premium money was furnished by the Knoxville Clearing House Association, in the interest of better live stock in Tennessee.

Washington Station.—A project for a joint cooperative substation with this Department to be located at Waterville has been approved by the board of regents. E. F. Gaines, acting cerealist, has been granted six months' leave of absence for study at Harvard University.

Wisconsin Station.—The department of plant pathology, which has hitherto carried on its experimental work largely in infected fields over the State, has been given additional plats at the station. Attempts are to be made to produce a disease-resistant cabbage, a blight-resistant pea, and a smut-free barley.

Wyoming University and Station.—Karl Steik, assistant professor of chemistry and engineering chemist in the station, has been given leave of absence until July 1 to pursue graduate work at Harvard University.

American Association of Economic Entomologists.—The twenty-seventh annual meeting of this association was held at the University of Pennsylvania, December 27-31, 1914. Over 40 papers were presented, including that of the president, H. T. Fernald, of Massachusetts. A draft of a uniform state law covering nursery and orchard inspection was favorably considered.

The next annual meeting is to be held at Columbus, Ohio, with the American Association for the Advancement of Science, and a special meeting at San Francisco during the summer. Officers were elected as follows: President, G. W. Herrick, of New York; vice-presidents, R. A. Cooley, of Montana, W. E. Rumsey, of West Virginia, and E. F. Phillips, of Washington, D. C.; secretary, A. F. Burgess, of Massachusetts; secretary of the section of horticultural inspection, J. G. Sanders, of Wisconsin; and secretary of the section of apiary inspection, N. E. Shaw, of Ohio.

Agriculture at the British Association.—The last meeting of the British Association held at Melbourne and Sydney, Australia, gave unusual attention

to agriculture and related subjects. In the agricultural section, the presidential address was given by A. D. Hall. The special subjects for consideration were irrigation (jointly with the engineering section), dry farming, animal breeding, and milk supply, all with special reference to Australian conditions.

L. J. Briggs described dry farming investigations in the United States as compared with conditions in Australia; T. Cherry discussed the 10-inch line of rainfall; J. W. Patterson compared the high evaporation factor in Western Australia with the small factor in England; and Heber Green discussed the capillary power of soils.

In animal breeding, P. G. Bailey reported progress on experiments in inheritance in wool characters and on size inheritance in poultry. The value of milk production records was taken up by A. Lauder, S. S. Cameron, and M. A. O'Callaghan. The development of milking machines was outlined by R. T. Archer, and their effect on the bacteriological purity and keeping qualities of milk by R. Stenhouse Williams, J. Golding, and J. MacIntosh.

Cereal breeding was a most prominent topic. The papers included *The Migration of Reserve Material to the Seeds in Barley, Considered as a Factor in Production*, by E. S. Beaven; *Wheat Improvement in Australia*, by F. B. Guthrie; *Wheat Breeding in Australia*, by A. E. V. Richardson; and *William Farrer's Work, Methods, and Success*, by J. T. Pridham.

Other papers included *Flax as a Paying Crop*, by C. P. Ogilvie; *Bacterial Toxins in Soils*, by R. Greig-Smith; *The Estimation of Condition in Cattle*, by J. A. Murray; *A Review of Work on Soil Inoculation*, by H. B. Hutchinson and J. Golding; and *The Effects of Caustic Lime and Chalk on Soil Fertility*, by H. B. Hutchinson and K. MacLennan. A large number of agricultural excursions were arranged to typical farms, the Roseworthy Agricultural College, the Central Research Farm at Werribee, Victoria, the Wagga Experimental Farm, and the Hawkesbury Agricultural College.

A joint session was held with the chemical section on the chemistry of metabolism. The zoology section included papers on *The Development of Trypanosomes in the Invertebrate Host*, by E. A. Minchin; *Australian Trematodes and Cestodes*, by S. J. Johnston; *Parasitic Worms of Queensland*, by W. Nicoll; *Mimicry*, by E. P. Poulton; *Experiments on Silkworms*, by O. Maas; and *Migration of Birds*, by C. J. Patten.

Agricultural Reorganization in Portuguese East Africa.—Plans are being prepared for a reorganization of the agricultural work in Mozambique. A central department is contemplated with headquarters at Lourenço Marquez, and divided into bureaus of agriculture and forestry and animal husbandry. The staff of the bureau of agriculture and forestry would include a botanical explorer, a silvicultural engineer, an entomologist, an inspector of fruits and plants, and an agricultural engineer with an agricultural expert in charge of the agricultural station at Inhamussua, and assistants. That of the animal husbandry bureau would include a corps of veterinarians as chief and assistant chief, and in charge of divisions of animal sanitation, tropical veterinary pathology and zootechny, and their assistants.

A Board of Agriculture for New Zealand.—The minister of agriculture has recently announced that it has been decided to establish a board of agriculture for New Zealand to consist of 12 members. Its duties will be to advise the minister of agriculture on any matters affecting agriculture that he may refer to it for consideration; to appoint special committees of agricultural experts to inspect the work of departmental institutions, such as the experimental farms and State agricultural colleges, and also to inquire into and report upon any urgent agricultural problems of the day; and to consider the policy of the de-

partment in regard to such matters as the collection of agricultural statistics, the dissemination of agricultural information, the control of noxious weeds, the prevention of stock diseases, the fostering of fruit growing and forestry, recommendations from agricultural conferences, rural education, better means of communication, and other measures intended to make rural industry more efficient and rural life more desirable.

Necrology.—Dr. John Nisbet, forestry advisor to the Scottish Board of Agriculture, died recently, aged 62 years. Dr. Nisbet was educated at the Edinburgh University and Munich and for 25 years was connected with the Indian Forest Service, retiring in 1900 with the grade of conservator of forests. He also made extensive studies of British and continental forests and did much to arouse interest in forestry in the British Isles. He was the author of many works on forestry, notably *British Forest Trees*, 1893; *Protection of Woodlands*, 1893; *Essays on Silviculture*, 1893; *Studies in Forestry*, 1894; *The Forester*, 1905; *Our Forests and Woodlands*, 1908; and *The Elements of British Forestry*, 1911.

Sir Walter Gilbey, a horse breeder, who founded the Shire Horse Society and was active in the establishment of the Hackney Horse Society, died November 12, 1914, at the age of 83 years. He had a wide, practical knowledge of horses and horse breeding and had written several books on the Hackney and Shire breeds.

August Weismann, the eminent zoologist and biologist, died November 6, 1914, aged 80 years. He had been professor of zoology at Freiburg University since 1867.

Miscellaneous.—Harrison E. Smith has been appointed entomologist at the entomological laboratory at West Springfield, Mass. A 4-room laboratory building is being erected on land owned by the Eastern States Agricultural and Industrial Exposition. The laboratory will be under the direction of the Bureau of Entomology of this Department and devoted largely to research with forage and cereal crop pests.

The Southeastern Agricultural College, Wye, has completed its new buildings at a cost of \$62,500, of which over half was contributed by the Board of Agriculture and Fisheries. A vacuum drying plant for experimenting on fruit and vegetable drying has been installed under an additional grant from the same source.

James Murray, from 1906 to 1911 superintendent of the Dominion Experimental Farm at Brandon, Manitoba, and subsequently manager of a large farm at Suffield, Alberta, has been appointed to the chair of cereal husbandry in Macdonald College, vice L. S. Klinck whose appointment as dean of the college of agriculture of the University of British Columbia has been previously noted.

The American Society of Agricultural Engineers held its eighth annual meeting at Madison, Wisconsin, December 28–30, 1914. Officers were elected as follows: President, H. H. Musselman, of Michigan; vice-presidents, J. E. Wagner, of Illinois, and L. W. Ellis, of California; and secretary-treasurer, F. M. White, of Wisconsin.

A tract of 919 acres at Trinidad, Luzon, Philippine Islands, has been reserved from the public domain for the use of the Bureau of Agriculture as an experiment station and stock farm.

EXPERIMENT STATION RECORD.

VOL. XXXII.

APRIL, 1915.

No. 5.

The act making appropriations for the support of the Federal Department of Agriculture for the fiscal year ending June 30, 1916, has, like its immediate predecessors, considerably more of interest for the general public than as a mere routine measure. As the activities of the Department have been expanded and new functions have been given it to perform, a great institution with over 16,000 employees has been developed which, in its various phases, touches most intimately the daily life of the whole American people. In consequence, the act providing appropriations for the maintenance of such vast enterprises as the federal system of research and demonstration, the weather forecasts, the food and drugs control, the meat inspection, the campaigns against plant and animal pests, and many others has immediate significance as an annual review by Congress of these manifold lines of endeavor, and as a renewed expression of its opinion as to the kind and amount of work to be undertaken and the details of the organization to carry it on.

The latest of these acts, signed by President Wilson March 4, 1915, in the closing hours of the Sixty-third Congress, carries a total of \$22,971,782. The act for the current year appropriated \$19,865,832, but if comparison is attempted there should be added to this the supplemental grants authorized in the deficiency appropriation act of January 25, 1915, of \$2,500,000 for the foot-and-mouth campaign, \$35,000 for citrus canker studies, and \$349,243 for general expenses of the Forest Service in consequence of the disastrous forest fires of 1914, which increased the total to \$22,750,075. This is but \$221,707 below the aggregate in the new act.

As a matter of fact with a few exceptions, notably the large increases for marketing investigations and some additions for inspection and other regulatory work, the existing projects are in the main continued with the same allotment of funds as at present. Likewise, comparatively few new lines have been provided, the policy apparently being one of maintenance rather than of further extension at this time. There are, however, many changes as to legislation embodied in the act, and a regrouping of a number of the projects under the new plan of departmental organization.

It will be recalled that in the appropriation act for the current fiscal year, the Secretary of Agriculture was directed to prepare a plan "for reorganizing, redirecting, and systematizing the work of the Department of Agriculture as the interests of economical and efficient administration may require." In accordance with this direction, a proposed plan of reorganization was submitted with the estimates and here approved by Congress, becoming effective July 1.

Under the new plan substantially the present bureau organization is continued, but various transfers will be made from bureau to bureau. Thus, the various relations of the Department to the state agricultural colleges and experiment stations and similar institutions will be gathered together around the Office of Experiment Stations, which, because of this broader scope, will be known as the States Relations Service. This change involves the transfer to the new bureau of the farm demonstration work and of the farm home management work now conducted by the Bureau of Plant Industry, the latter through its Office of Farm Management. It is expected that the demonstration work of the South and of the North and West will be conducted as a new branch of the States Relations Service, while the farm home management work will be associated with the food work of the Office in a proposed division which is expected to cover the broader subject of home economics, including studies of food, clothing, and household equipment and management. On the other hand, the Irrigation and Drainage Investigations of the Office of Experiment Stations will be detached from it, and together with the farm architectural work now conducted by the Office of Farm Management will be recombined with the Office of Public Roads to form the Office of Public Roads and Rural Engineering.

Specific provision is made for an Office of Markets and Rural Organization under that name, which will carry on the existing lines of work in studies on cooperative handling and marketing of agricultural products, transportation and storage problems, rural credits and insurance, and other forms of cooperation in rural communities. The new office will also take over the farm credit and insurance inquiries of the Office of Farm Management, the cotton standardization work with the exception of certain technological investigations from the Bureau of Plant Industry, and studies on the marketing of milk from the Bureau of Animal Industry; and will cooperate with the Bureau of Animal Industry and the Bureau of Chemistry in the poultry and egg work of the Department.

The total appropriation for these purposes has been increased to \$409,050. In addition, \$75,000 is granted to enable the Secretary to carry out the provisions of the United States Cotton Futures Act of August 18, 1914, this supplementing the appropriation of \$150,000 carried in the act itself and available until expended for designating

the bona fide spot markets contemplated by the act, prescribing rules and regulations as to contracts in "future sales" of cotton exempt from tax, and settling differences as to quality, grade, or length of staple, establishing standards, and publishing results.

The studies of the Office of Farm Management pertaining to the utilization of cacti and other dry-land plants and to weed eradication methods remain in the Bureau of Plant Industry. The office itself becomes a unit of the Office of the Secretary, receiving \$36,080 for statutory salaries, \$230,000 to investigate and encourage the adoption of improved methods of farm management and farm practice, and \$5,000 for studies of clearing and utilizing "logged-off" lands.

Studies of the biology of insect parasites of animals are henceforth to be conducted by the Bureau of Entomology. Other minor transfers include the poisonous plant studies as related to the effects on animals from the Bureau of Plant Industry to the Bureau of Animal Industry; the soil fertility studies from the Bureau of Soils to the Bureau of Plant Industry; and the wood distillation work from the Bureau of Chemistry to the Forest Service.

Another change of much importance involved in the reorganization, which may be noted here, has been in gradual process for some time. This is a sharper segregation within the bureaus of the research, the regulatory, and the educational or extension work. The object of this is to make definite provision for discharging the regulatory or control functions of the Department, so that these may not interfere with the other activities. This is a step in the right direction, and is in full harmony with the organization or division made at many of the experiment stations charged with regulatory functions.

The appropriations allotted to the Bureau of Animal Industry aggregate \$2,585,536. These are in addition to the permanent appropriation of \$3,000,000 per annum for meat inspection, and also of an emergency provision elsewhere in the act authorizing the Secretary of Agriculture to expend \$2,500,000 in the arrest and eradication of animal diseases which may threaten the live-stock industry of the country. As compared with the routine appropriations of the bureau at present there is an apparent increase of \$265,510, but \$235,000 is for the investigation, treatment, and eradication of hog cholera and dourine and the inspection of virus, serums, etc., for which provision was made in 1914 under a special act carrying \$600,000, a portion of which will still be available.

The appropriation for the cattle tick campaign is increased from \$400,000 to \$438,800, of which \$50,000 is allotted to live stock demonstration work in cooperation with the States Relations Service in areas freed of ticks. The animal husbandry work receives \$189,060, this including a reduction of \$5,000 in the subappropriation for

horse breeding, an increase of \$10,000 for poultry feeding and breeding, and smaller increases for other purposes. The work in dairy-ing receives \$254,090.

The appropriation for inspection and animal quarantine work is reduced to \$607,780, while that for pathological investigations of animal diseases is increased to \$85,940 because of the stock-poisoning plant studies transferred from the Bureau of Plant Industry. The supplementary appropriation for meat inspection remains at \$375,000.

Largely because of the extensive transfers already noted and some reapportionment of funds, the appropriations for the Bureau of Plant Industry show an aggregate decrease from \$3,616,045 to \$2,139,150. The allotment for the control of diseases of forest and ornamental trees and shrubs is apparently reduced from \$69,510 to \$57,175, and the language is so rewritten as to restrict the work to investigations for the discovery of new methods of control. The congressional seed distribution is continued on the usual basis with an allotment of \$252,540, but the funds for the distribution of new and rare seeds and the improvement of alfalfa, clover, and other forage crops, although combined with the cactus utilization work of the Office of Farm Management, are reduced to \$119,920, the amount available for the distribution of drought-resistant field seeds in the dry-land sections being decreased from \$100,000 to \$60,000. For the foreign seed and plant introduction \$70,400 is provided.

Among the increases are the following: For the control of diseases of orchard and other fruits, \$3,440 to continue the study of citrus canker; for the control of truck crop diseases, \$10,000 for a study of cucumber diseases and the extension of the work on powdery scab of potatoes; for soil bacteriology and plant nutrition studies, \$7,000, additional authority being given to test samples of commercial cultures for legume inoculation and the publication of results; and for cereal diseases, \$6,600 for the extension of studies of black rust.

The appropriations for the Forest Service aggregate \$5,553,256, substantially as at present, but there is some rearrangement of funds and considerable new legislation. The bulk of the appropriation is as usual devoted to the protection and maintenance of the individual National Forests. The allotment of \$150,000 for forest fire protection is continued, as is also that of \$100,000 for cooperation with the States in fire protection under the Appalachian Forest Reserve Act of 1911, but the appropriation of \$100,000 additional for fighting and preventing forest fires in cases of extraordinary emergency has been omitted. Authority, however, is given the Secretary of Agriculture to expend interchangeably for this and other unforeseen exigencies not to exceed 10 per cent of the various funds apportioned to the specific National Forests. The authority previously exercised

for the use for administrative purposes of not to exceed 15 per cent of all the funds appropriated for general expenses is modified by the allotment of specific funds for administration in each of the seven national forest districts and the District of Columbia.

The selection and segregation of lands within National Forests that may be opened to entry under the homestead act is to be continued under an appropriation of \$100,000, with \$85,000 and certain unexpended balances additional for the survey and listing of lands chiefly valuable for agriculture. A new item is inserted of \$60,000 for appraising timber and other resources on the National Forests.

The wood utilization and preservation studies have been broadened to include tests of foreign woods of commercial importance to American industries, the appropriation of \$140,000 remaining unchanged. Other allotments include \$30,000 for range studies, \$83,728 for silvicultural and dendrological experiments, \$165,640 for reforestation, \$400,000 for the construction and maintenance of improvements on National Forests, and \$40,160 for miscellaneous studies and the publication of results.

In order to promote a wider public use of the National Forests, authority is given for issuing permits under certain conditions for the use, for not exceeding 30 years, of tracts of five acres or less for the construction of summer hotels, cottages, and the like. The use of earth, stone, and timber is granted to the Navy Department and for the construction of government railways and other works in Alaska.

There is a decrease from \$1,077,581 to \$1,066,381 in the appropriations of the Bureau of Chemistry, largely because of a reduction in the item for poultry and egg studies, which are made cooperative with the other bureaus. A specific appropriation of \$10,000 is made for the study and improvement of methods of utilizing by-products of citrus fruits, while to the item for biological investigations of foods and drug products and ingredients has been added authority for studies of the effects of such products on the human organism. The Secretary is authorized to furnish samples of pure sugars, naval stores, microscopical specimens, and other products to state and municipal officers, educational institutions, and others at cost. The allotment for the enforcement of the food and drugs act is \$635,161. There is also \$4,280 for tests of American food exports, but hereafter exporters desiring analyses must pay the cost of inspection.

The Bureau of Biological Survey receives an increase from \$281,290 to \$446,290. Its appropriation for studies of the food habits of birds and mammals and other biological investigations was more than doubled, not less than \$125,000 being specifically allotted for destroying wolves, coyotes, and other injurious animals on National Forests

and the public domain. The remaining allotments are substantially as at present.

Under the plan of organization already described, the States Relations Service is established with an initial appropriation of \$2,821,840. This exceeds by \$891,060 the present appropriation for the Office of Experiment Stations, and is the largest allotment for any bureau except the Forest Service. This appropriation does not include the grants to the States under the Smith-Lever Act, which for the ensuing year may reach \$1,080,000, but as usual contains \$1,440,000 to be paid to the state experiment stations under the Hatch and Adams acts. Authority is granted the Secretary of Agriculture to coordinate the work of the Department and the state agricultural colleges and experiment stations under these three acts, with an appropriation of \$59,500 for their enforcement, of which \$20,100 may be used for general administrative expenses of the States Relations Service as a whole. The farmers' cooperative demonstration work of the Department is continued without change in appropriations, \$666,020 being allotted to the work in the cotton belt and \$386,080 for the remainder of the country.

The States Relations Service also has at its disposal \$103,140 for statutory salaries, \$20,600 for the Agricultural Education Service, and \$26,500 for the studies of the utilization of agricultural products for food, clothing, and other uses in the home. The appropriation of \$120,000 for the insular stations is also continued, but their revenues, particularly that of the Alaska stations, will be somewhat reduced through the omission of the provision carried for many years allowing them to utilize the funds derived from the sales of farm products, as at the state experiment stations. Formal provision was made for continuing the card index of agricultural literature under the new plan of organization, and the annual report on the work and expenditures of the stations was enlarged to include a similar report on the work under the Smith-Lever Act.

The appropriation for the Office of Public Roads and Rural Engineering aggregates \$586,465. No increases are made in any of the allotments, \$75,960 being granted for statutory salaries, \$282,420 for the work with roads, \$106,400 for irrigation investigations, \$96,280 for drainage investigations, \$12,805 for studies of farm water supplies and drainage disposal, the construction of farm buildings, and other rural engineering problems, and \$12,600 for general administrative expenses. The paragraphs pertaining to irrigation and drainage were rewritten to confine these lines more closely to farm problems, but the Department is given increased authority as regards the study of rural engineering problems in general.

The work of the remaining bureaus is continued on substantially the present basis, both as to funds and lines of work. The Weather Bureau is granted \$1,666,050; the Bureau of Soils, \$327,935; the Bureau of Entomology, \$829,900; and the Bureau of Crop Estimates, \$283,480. The Office of the Secretary receives in addition to the allotments for the Office of Farm Management already noted, \$352,040; the Division of Accounts and Disbursements, \$44,920; the Division of Publications, \$193,500; and the Library, \$46,020. An increase of \$5,000 is granted for rent, chiefly to meet the need for additional quarters, and \$5,000 for miscellaneous expenses.

Appended to the appropriations for the several bureaus are as usual a number of items without specific assignment. Among those not already discussed is \$100,000 for the enforcement of the insecticide act, an increase of \$5,000 being requested because of the constantly growing number and quantity of insecticides and fungicides.

The present appropriation of \$50,000 for the enforcement of the Plant Quarantine Act is continued, and the supplementary grant of \$50,000 for cooperation with States quarantined against the interstate movement of Irish potatoes is increased to \$100,000, of which \$25,000 is immediately available. The act is also amended as regards interstate shipments by mail into States maintaining a system of terminal inspection of plant products, by requiring under certain conditions the labeling of packages of plants and plant products and their transmission to central points for inspection.

The appropriation of \$60,000 for demonstration work in live-stock production in the cane sugar and cotton districts is continued and authority is given to spend not to exceed \$7,500 of the current year's funds for the erection of barns and other buildings. The Secretary is also given further authority to dispose of animals or animal products no longer needed, and is again granted \$5,000 for studies of naval stores.

The special appropriation of \$40,000 for demonstrations on reclamation projects with a view to their agricultural development is also continued, and so is an appropriation of \$20,000 for an exhibit at the next annual International Dry Farming Congress. The President is authorized to extend invitations to other nations to participate in this congress, which is expected to be held in Denver, Colorado, September 27 to October 8, 1915.

Provision is made for the acquisition of a small tract in Oklahoma for use as a dry farming or subhumid station. For exchange of lands or indemnity rights for the State of Washington, \$50,000 is granted, this to be duplicated by the State.

The allotment of \$2,500,000 for use in emergencies, such as the foot-and-mouth disease epidemic, has already been referred to. This

fund is to be available among other purposes, for the payment, in co-operation with the States, of claims growing out of either past or future purchases and destruction of animals or materials irrespective of ownership provided all quarantine regulations have been complied with. Specific authority is given the Secretary of Agriculture to pay not more than one-half the expenses incurred in quarantine of the animals exhibited at the National Dairy Show in 1914, the total expense under this item being restricted to not over one-half of the beef or dairy value of such animals.

Much interest was manifested by Congress in the subject of rural credits, and a joint congressional committee was authorized to investigate and report by January 1, 1916, a bill or bills providing for "the establishment of a system of rural credits adapted to American needs and conditions." An appropriation of \$10,000 was granted for the use of the committee.

In connection with the appropriations included in the act itself, reference should also be made to the funds derived in other ways. For the fiscal year under discussion, the permanent appropriations under the Department will aggregate over \$5,000,000, the largest items being those of \$3,000,000 for meat inspection and \$1,080,000 under the Smith-Lever Act, the remainder being almost wholly for payments to the States of their quota of the receipts from the National Forests and other forestry purposes. The appropriation act for sundry civil expenses as usual carries the appropriation for the department printing and binding, \$500,000 being allotted as at present, of which \$137,500 is for Farmers' Bulletins and \$47,000 for the Weather Bureau.

Nor are the federal appropriations for agricultural purposes confined to the Department of Agriculture. The usual large appropriations will be available for agricultural education in the land-grant colleges under the Morrill and Nelson acts, for the rural education work of the Bureau of Education, demonstration work among the Indians, and the payment of the country's quota toward the support of the International Institute of Agriculture, and aid is also given through participation in such enterprises as the forthcoming Pan-American Scientific Congress, a notice of which is given elsewhere.

The continuance of the various lines of work under way in the Department is thus provided for to much the same extent as at present. The acceptance of its plan of reorganization, by authorizing a regrouping of its activities along more logical lines, is of special interest and importance. The changes contemplated should tend to increase its efficiency, and together with the enlarged facilities in some directions enable it to cope more effectively than ever before with the complex problems with which it is being called upon to deal.

RECENT WORK IN AGRICULTURAL SCIENCE.

AGRICULTURAL CHEMISTRY—AGROTECHNY.

The quantitative determinations of mono-, di-, and tricalcium phosphates and their application, G. A. OLSON (*Washington Sta. Bul. 116 (1914), pp. 18*).—A critical discussion of the methods in use for determining the value of fertilizers as regards the phosphoric acid available to the plant.

The author believes that all chemical tests of phosphate fertilizers should be limited to the determination of total phosphoric acid and that which is not precipitated with an alkaline solution such as ammonium hydroxid. As ammonium citrate acts upon tricalcium phosphate as well as dicalcium phosphate the method in use for determining phosphoric acid at the present day is deemed empirical.

"Substances soluble in ammonium citrate are not necessarily mono- and dicalcium phosphate, but also tricalcium, iron, and aluminum phosphates. Ammonium citrate-soluble is not a measure of the phosphoric acid contained in a fertilizer available for plants. If it is desirable to estimate the mono-, di-, and tricalcium phosphates, this can be done in a scientific manner by dissolving the substance in nitric acid and precipitating the solution with ammonium hydroxid. For the monocalcium phosphate two-thirds of the phosphoric acid will be present in the filtrate, and for the dicalcium phosphate one-third the phosphoric acid will be present in the filtrate. Upon these bases the three forms of calcium phosphate can be differentiated and determined quantitatively in the presence of each other.

"The ammonium hydroxid method is applicable for the testing of the purity of phosphate chemicals. It can also be applied to differentiate between the different forms of phosphoric acid that may be present in soils, plant, and animal tissue. Indirectly, by adding the equivalent of a base with calcium the different forms of phosphate salts can be determined. In soil mono- and dicalcium phosphates tend to react, forming tricalcium phosphate. There is then nothing to be gained by applying either superphosphate or reverted phosphoric acid to soil."

A comparison of neutral ammonium citrate with sodium citrate and tenth-normal citric acid, P. RUDNICK, W. B. DERBY, and W. L. LATSHAW (*Jour. Indus. and Engin. Chem., 6 (1914), No. 6, pp. 486, 487*).—The figures for phosphoric acid obtained with a sample of acid phosphate by treatment with sodium citrate solution of the concentration described by Bosworth (*E. S. R., 31, p. 714*) were much higher than those yielded by the neutral ammonium citrate solution. When, however, the concentration was increased the results compared more favorably with those with neutral ammonium citrate.

"The disadvantages of working with heavy solutions suggested the possibility of using a citric acid solution of suitable concentration as a substitute. After trying various strengths ranging from 2 per cent, as used for basic slag analyses, downward, it was found that a tenth-normal solution of citric acid gave results approximating quite closely to those obtained with neutral ammonium citrate."

The substances studied in addition to the acid phosphate mentioned above were tankage, raw bone meal, and complete fertilizer. Tenth-normal citric

acid is, according to the author, entitled to consideration "as a promising substitute for neutral ammonium citrate solution, as it not only gives results substantially identical with those obtained with the present official reagent for determining insoluble phosphoric acid, but has, moreover, at least two important advantages over ammonium citrate. Tenth-normal citric acid is much more easily prepared and standardized than neutral ammonium citrate solution. Extraction with tenth-normal citric acid is as easy and rapid as with hot water, the time of filtration, particularly in bone, tankage, and complete fertilizers, being cut down to a very few minutes."

The composition of lime-sulphur solutions, F. THOMPSON and A. C. WHITTIER (*Delaware Sta. Bul. 105 (1914), pp. 3-30, figs. 2*).—In most work hitherto published on the composition of lime-sulphur solutions the methods employed were based on the assumption that only thiosulphate and polysulphids of calcium are present in these solutions, with possible traces of sulphite and sulphate.

"Lime-sulphur solutions consist principally of pentasulphid and thiosulphate of calcium, but may contain hydrosulphids, oxysulphids, free sulphur in solution, and free lime, depending upon the method used in making them. Calcium pentasulphid is the only true polysulphid present: When the ratio of lime to sulphur is 1:2.25, the preparation consists of pure calcium pentasulphid and calcium thiosulphate, the reaction being expressed by the equation, $3\text{Ca}(\text{OH})_2 + 12\text{S} = \text{CaS}_5 + \text{CaS}_2\text{O}_3 + 3\text{H}_2\text{O}$. When the proportion of lime used is greater than that expressed by the ratio 1:2.25, oxysulphids and hydrosulphids are formed and free lime appears in the solution and the ratio of mono- to polysulphid falls below 1:5. When the proportion of sulphur used is greater than that expressed by the ratio 1:2.25, free sulphur is found in the solution and the ratio of mono- to polysulphid sulphur increases above 1:5.

"On long-continued boiling lime-sulphur solutions decompose completely with the formation of hydrogen sulphid, calcium sulphite, free sulphur, and calcium thiosulphate. On oxidation in the air at ordinary temperatures lime-sulphur solutions are completely decomposed with the formation of calcium thiosulphate and free sulphur, no sulphite and very little hydrogen sulphid being formed. The presence of magnesia is without effect in the making of lime-sulphur solutions excepting as a diluent of the lime. Self-boiled lime-sulphur solutions differ from the concentrated preparations in containing large quantities of free lime in solution. Injury to foliage when used as a summer spray is decreased by the presence of free lime in solution. Lime-sulphur solutions never contain sulphites in solution."

The occurrence of methyl alcohol in corn silage, E. B. HART and A. R. LAMB (*Jour. Amer. Chem. Soc., 36 (1914), No. 10, pp. 2114-2118*).—In this work normal silage was found to contain small amounts of methyl alcohol. A number of tests were made of the distillates from several samples of silage, the tests being first standardized by using various known mixtures of alcohol. The hypothesis is advanced that at least a part of the methyl alcohol is formed through the agency of micro-organisms acting on glycine. The work thus far with water cultures and experimental silage has given results which supports this hypothesis.

See also previous notes (E. S. R., 28, pp. 109, 608, 609).

Enzymes present in alfalfa.—Alfalfa investigation, V, C. A. JACOBSON and A. HOLMES (*Jour. Amer. Chem. Soc., 36 (1914), No. 10, pp. 2170-2182*).—This is a continuation of investigations reported previously (E. S. R., 28, p. 710).

"The present investigation was designed to cover the more common enzymes encountered in vegetable juices and extracts, but no attempt has been made to isolate the different ones from their media, nor to study them in minute detail.

Their presence in the water extracts of the dried and fresh alfalfa stems and leaves, as well as in the alfalfa roots, has been determined qualitatively and in some instances with reference to the approximate amount. The following table sets forth the results obtained in the present investigation, together with those obtained on alfalfa seeds. The presence of the enzym is denoted by + and the absence by —. The (s) after the sign denotes in small amount, and the (l) in considerable or large amount.

Enzyms present in alfalfa.

Kind of enzym.	Dried plants.	Fresh plants.	Fresh roots.	Seeds.
Lipase.....	—	+(s)	—	—
Amylase.....	+(s)	+(s)	+(s)	+
Coagulase.....	—	+	+	+
Emulsin.....	+(l)	+(l)	+(s)	+
Invertase.....	+	+(s)	+	—
Peroxidase.....	+(s)	+	+(l)	+
Maltase.....	—	—	—	—
Lactase.....	—	—	—	—
Pectinase.....	+(l)	+(l)	+	—
Protease (peptonizing).....	—	—	—	—
Protease (peptolytic).....	+	+	—	+

“The diastatic power of the water extract of the dried plants was determined and found to be approximately 20. A slight alkalinity favors the action of the protease on casein, whereas an acid solution above that spontaneously produced in the extract retards or inhibits this action. No digestion of egg albumin could be detected by the proteases in any part of the plant, but this substance invariably retards the action of the enzym on casein. It was also found that the inhibiting influence of egg albumin on the casein digestion was proportional to the time of action and not to the temperature.

“It is hoped that a more detailed investigation of individual members of the alfalfa enzymes can be undertaken in the near future.”

Ferments in the mammary gland and milk, W. GRIMMER (*Biochem. Ztschr.*, 53 (1913), No. 6, pp. 429–473).—The object of this work was to determine whether the enzymes usually found in milk are also present in the lactating mammary glands, and furthermore to establish whether any difference exists between an active and a nonlactating gland. In the investigations the mammary glands of the bovine, sheep, pig, and horse were studied. The glandular extracts, made with solutions of sodium chlorid by autodigestion and tissue paste, were examined for protease, ereptase, monobutyrynase, amylase, salolase, and peroxidase. The glycerol extracts were tested for aldehydase, reductase, and hydrogenase. A portion of the results have already been noted (*E. S. R.*, 23, p. 285).

Both the resting and the active glands contain proteolytic ferments (protease), which apparently digest only the proteins of the mammary gland and not fibrin, gelatin, or fowl egg albumin. The cleavage products recognized were glycoll, leucin, and some other substances belonging to the amino acid groups which could not be identified. The proteolytic ferments of the active and resting glands of the various animals differentiated themselves by the fact that the autolysate of the active gland contains ferments which yield tryptophan. This finding is considered of importance in explaining some of the factors which relate to the formation of casein, and may be interpreted in the light of Abderhalden's findings.

The press juices, saline extracts, and autolysates of lactating and nonlactating glands cleave silk peptones and yield tyrosin. The active and inactive

glands of all animals also contain a monobutyrim and a salol-cleaving enzym. Starch digesting enzymes are present in the resting and active glands of the horse and pig, in the active gland of the sheep, and in the resting gland of the bovine. In the active gland of the bovine amylase was present to only a very slight extent. Peroxidase (guaiac) was present only in the lactating glands and this enzym is apparently not identical with the paraphenylendiamin oxidase.

About some peroxidase reactions of milk, T. JONA (*Arch. Farmacol. Sper. e. Sci. Aff.*, 15 (1913), No. 3, pp. 122-130; *abs. in Chem. Zentbl.*, 1913, I, No. 20, pp. 1790-1792).—In this investigation both raw and boiled milk were used and to each various preservatives were added to determine their influence upon the outcome of the peroxidase reaction. The effect of temperature upon the peroxidase reaction was also studied. The antiseptics studied were borax 1 per cent, boric acid 1, salicylic acid 0.2, benzoic 0.2, sodium bicarbonate 1, mercuric chlorid 0.1, a solution of phenol in alcohol, and ammoniacal copper sulphate solution 0.45 per cent.

Preservatives when present destroyed the peroxidase reaction much quicker than when milk was heated without them. A strong inhibition, however, was noted with salicylic acid and mercuric chlorid. The peroxidase reaction on the one hand and the acidity of the milk on the other hand may aid in determining the age of a milk, but the conclusions drawn on the basis of the peroxidase reaction alone must be considered as final. The addition of acids to milk has various effects on the outcome of the reaction. Acetic, citric, and tartaric acids destroy the reaction with paraphenylendiamin, while the guaiacol test is not influenced even when large amounts of the acids are present. Oxalic, nitric, hydrochloric, and sulphuric acids affect both reactions markedly.

Peroxidase was not fixed by ordinary substances which liberate active oxygen, but more tests are necessary to clear up this point. Hematin solution (Gaucher test) was decolorized in 6 minutes by boiled milk, but an addition of 20 per cent of raw milk did not decolorize within 25 minutes and 40 per cent of raw milk produced no decoloration whatever. A raw milk containing 0.2 per cent of neutral formaldehyde (38 per cent solution) or hydrogen sulphid decolorized hematin instantly. The same milk, when boiled and after adding 1 per cent hydrogen peroxid, showed an incomplete decoloration within 20 minutes. Potassium bichromate (1 per cent solution) and mercuric chlorid (0.3 per cent) also hinder the reaction.

The freezing point and chemical composition of the milk from a model farm in 1911 and 1912, J. SCHRÖDER (*Rev. Min. Indus. Uruguay*, 2 (1914), No. 8, pp. 63-67).—This is a study of the milk from four Holstein cows taken at various seasons of the year. The determinations made were specific gravity, fat, ash, total solids, total solids-not-fat, and freezing point.

The freezing point depression varied from 0.54 to 0.56, with an average of 0.547 per cent. The average density of the milk for the experimental period was 1.0308 at 15° C., the fat content 3.34 per cent, ash 0.71, and total solids 11.81. The freezing point was depressed by the addition of water to the milk.

Analyses were also made of the mixed (composite) milk from the same dairy.

The freezing-point of milk, J. B. HENDERSON and L. A. MESTON (*Chem. News*, 110 (1914), Nos. 2870, pp. 259-261; 2871, p. 275; 2872, pp. 283, 284, fig. 1).—It is reported that results from 63 samples of milks obtained during the past five years show that in 54 the added water content indicated by the freezing-point was from 0.2 to 9.9 per cent higher than that calculated on an 8.5 per cent solids-not-fat basis, the average being 4 per cent. In five cases, the calculation of added water by the two methods was practically identical. In

three other cases the estimated added water on the 8.5 per cent solids-not-fat basis from 1.7 to 3.9 per cent lower than by the freezing-point.

The freezing-point of milk as a standard for the detection of watering is discussed and the method of application described.

Determination of the amount of water added to milk based on the degree of acidity, V. GERÖ (*Kísérlet. Közlem.*, 16 (1913), No. 5, pp. 663, 664; *abs. in Internat. Inst. Agr. [Rome], Mo. Bul. Agr. Intel. and Plant Diseases*, 5 (1914), No. 1, pp. 125, 126).—In using the acidity determination as an index for the freshness of a milk it was noted that the acidity of a watered milk was far below that of a pure milk. In Hungary the acidity of milks collected in the open market ranged between 17 and 22° (Thörner's method) while milks adulterated with water showed lower than 15° and in some cases as low as 10°.

A rapid method for determining the percentage of casein in milk, W. O. WALKER (*Jour. Indus. and Engin. Chem.*, 6 (1914), No. 2, pp. 131-133; *abs. in N. Y. Produce Rev. and Amer. Cream.*, 37 (1914), No. 26, pp. 1154, 1155).—A discussion of the principles underlying and the value of the test previously noted (*E. S. R.*, 31, p. 114). The average difference between 63 determinations as compared with the Hart centrifugal method (*E. S. R.*, 20, p. 12) was 0.03+ per cent.

The estimation and significance of the ammonia content of milk, J. TILLMANS, A. SPLITTERGERBER, and H. RIFFART (*Ztschr. Untersuch. Nahr. u. Genussmtl.*, 27 (1914), No. 1-3, pp. 59-76).—For the determination of the ammonia content of milk it is advisable first to remove the greatest part of the proteins with either a mercuric chlorid-hydrochloric acid solution or with lead subacetate in a sodium phosphate solution. The lead subacetate serum is treated with magnesium chlorid and sodium phosphate and the ammonia precipitated as magnesium ammonia phosphate. The precipitate is placed, filter paper and all, in a flask and distilled with magnesium oxid at atmospheric pressure. The method gives results which are comparable with those obtained by the vacuum method, which is cumbersome. Fresh milk contained from 3 to 4 mg. of ammonia per liter. The ammonia increases with the age of the milk and by boiling the milk at atmospheric pressure.

Under experimental conditions, cows' feces when added to milk did not increase the ammonia content at once, but did several days later. The determination of the ammonia content of milk is deemed of no value for detecting added water, but is a far better criterion for detecting bacterial contamination than either the methylene blue test, the degree of acidity, or the alcohol test, and is also valuable for judging milk destined for infant feeding.

The Neusal butyrometric method, E. REGGIANI (*Mod. Zootro, Parte Sci.*, No. 1 (1914), pp. 9-21).—A study of the method with normal, sterilized, boiled, watered, and skim milk, and milk preserved with hydrogen peroxid, lime water, salicylic acid, bichromate of potash, formaldehyde, boric acid, and sodium bicarbonate. As a rule the results obtained were slightly higher than those given with the usual acid butyrometric method, with the exception of the milk preserved with formaldehyde and the milk boiled for ten minutes where the results are lower.

An apparatus and method for determining the hardness of butter fat, A. E. PERKINS (*Jour. Indus. and Engin. Chem.*, 6 (1914), No. 2, pp. 136-141, figs. 4).—A description of an apparatus and method which is said to give more accurate results than methods previously described. With the method it is necessary to stir the sample while cooling to prevent the separation of zones of different hardness. Temperature was found to have a very marked effect on the hardness of the fat, and it is recommended that in testing for hardness the sample be kept at a constant temperature for six hours or more before heating.

"The temperature to which the fat had previously been subjected seemed to make no difference in the hardness provided the samples were treated as described. The determinations can be made with great rapidity after the samples are properly prepared. More closely agreeing duplicate determinations are procurable with this method in examining manufactured butter than in examining the rendered fat. The results obtained, however, are likely to be very greatly affected by variations in the method of preparing the butter; they probably will not truly represent the properties of the fat itself.

"The apparatus with slight modifications should be useful for other work of a similar nature."

Estimation of sucrose in the presence of lactose and in the milk preparations, J. N. RAKSHIT (*Jour. Indus. and Engin. Chem.*, 6 (1914), No. 4, pp. 307, 308).—In the analyses of several cans of condensed milk it was observed that boiling for 40 minutes with citric acid solution was not sufficient for inversion, and a method is suggested which is simple and which suffices for all practical purposes. It consists of determining the percentage of lactose by titration with Fehling's solution. "Then a measured quantity of Fehling's solution is boiled with a calculated quantity of sugar solution so that all the copper may be thrown out of solution with the simultaneous consequent decomposition of all lactose, when cane sugar alone will be left in solution. This can be readily estimated after the usual inversion and neutralization."

Boric acid as a milk preservative and its detection, H. KÜHL (*Ztschr. Fleisch u. Milchw. Hyg.*, 24 (1914), No. 14, pp. 329-333).—For detecting very small amounts of boric acid it is necessary to examine the milk ash. Small amounts, however, may be detected by acidifying 50 cc. of the milk with 1 cc. of hydrochloric acid if boric acid is suspected and 2 cc. of hydrochloric acid if borax is thought to be present. The filtered opalescent serum is then tested with curcuma paper and the paper dried immediately on a watch glass over a water bath. A red coloration indicates boric acid or borax, and if a drop of ammonia is added to the paper it becomes bluish black.

As the germicidal action of boric acid is low and the substance is deleterious to human health, the author believes that its use as a preservative should be barred.

Comparative investigations on the utilization of the Mai and Rheinberger method for determining the total solids in cheese, H. WEIGMANN and E. HAGLUND (*Ztschr. Untersuch. Nahr. u. Genussmit.*, 27 (1914), No. 1-3, pp. 77-83).—The Mai and Rheinberger method gave from 1.84 to 3.7 per cent less moisture than did the German official sea sand method. Deferring the time of reading the liquid column in the first-named method did not alter the results. In order to determine whether the method has some errors, as in the decomposition of the cheese mass, tests were made with fresh acid and rennet curd, etc. The distillate from curd contained besides water decomposition products (ammoniacal), all distillates being strongly alkaline. The method must consequently give figures which are too high, and the sea sand method is preferred.

A rapid method for determining fat in cheese, TEICHERT (*Altgäuer Monatschr. Milchw. u. Viehz.*, 2 (1914), No. 1, pp. 13, 14).—In large cheese-selling establishments it is often necessary to have a rapid method for determining the fat content of cheese. For this work the butyrometer previously suggested by the author for determining fat in dried milk and graduated from 0 to 35 may be used.

In this method, 2.5 gm. of the cheese is dissolved in a porcelain dish with 8 cc. of sulphuric acid, specific gravity 1.6, and after solution the mixture is poured into the butyrometer. The dish is then rinsed with 8 cc. more of sulphuric acid, the washings poured into the butyrometer, 5 cc. of amyl alcohol

added, the butyrometer stoppered with a rubber, and centrifuged for five minutes. The butyrometer is then placed in a water bath for five minutes at 60 to 70° C., the height of the fat column noted, and again centrifuged for two minutes. The second centrifugalization is not absolutely necessary, but is recommended.

The method requires about 15 minutes for its execution.

A synthetic medium for the determination of colon bacilli in ice cream, S. H. AYERS and W. T. JOHNSON, JR. (*Abs. in Science, n. ser.*, 39 (1914), No. 1013), pp. 802, 803).—In a study of bacteria in ice cream an attempt was made to prepare a synthetic medium for the detection of colon bacilli. "During the experiments 53 different combinations were tried. The most satisfactory medium was made as follows: Agar, 1.5 per cent, asparagin 0.3 per cent, sodium dibasic phosphate 0.1 per cent, lactose 1 per cent, and 2 per cent of a saturated solution of litmus. The majority of the bacteria in ice cream did not grow on this medium, while colon bacilli showed quite characteristic acid colonies which with a little practice could be readily detected." The colon count in 43 samples of ice cream was compared with the estimated number from lactose bile tubes, and in 41 the number determined on the plates was higher than the estimated number from the tubes.

Suspected colon colonies on the asparagin plates from 19 samples were picked off and inoculated into lactose broth fermentation tubes. From 10 plates all the suspected colonies proved to be gas formers, while in the other 9 plates the percentages ranged from 87.17 to 98.01. "This shows that it is possible to detect quite accurately any colonies of gas-forming bacteria on litmus-lactose-asparagin agar. A comparison of this medium with Endo medium showed that the colon count on asparagin agar was much lower than that on the other medium. We found, however, that in some cases at least it was impossible to consider all typical colonies on Endo plates as colon bacilli. Certain strains of *Bacillus coli* failed to give typical colonies on Endo plates and acid and peptonizing bacteria gave reactions similar to some of the colon strains.

"It is evident that we have no entirely satisfactory method for the determination of colon bacilli, but it is believed that the use of synthetic media may be developed to a point where it will be superior to other methods."

The quantitative determination of added sodium chlorid in feeding stuffs, A. STRIGEL and O. HANDSCHUH (*Landw. Vers. Stat.*, 83 (1913), No. 3-4, pp. 309-316).—Tests were conducted with the method (E. S. R., 32, p. 22) on a large variety of feeding stuffs treated with sodium chlorid solutions. In one series of tests the titration was done before filtering off the precipitated silver chlorid and in the other after filtering. A sharp end point was obtained by the second method.

The use of bacterial rusts of flaxseed for determining fiber and waste of flax stems, E. A. DOMRACHEVA (*Zhur. Opytn. Agron. (Russ. Jour. Expt. Landw.)*, 14 (1913), No. 3, pp. 155-166, figs. 5).—A pure culture of a bacterial rust obtained from flax straw may be used for determining crude fiber and similar substances in flax stems. The culture is first isolated from an infusion of flax straw and then further propagated under anaerobic conditions on potato overspread with chalk. The test is made in a tall glass cylinder of 5 cm. diameter provided with a cork holding two glass tubes, one of which drops to the bottom of the cylinder, while the other is short. The flax stems are placed in the bottom of the cylinder and covered with boiling water. After a few minutes the water is poured off and replaced by fresh water, the long tube is connected with a steam generator, and the mass is sterilized for from 15 to 20 minutes with steam. The flax stems are then infected with the pure cultures of rust

bacteria and the cylinder with its contents is kept in a warm place until the flax residue sinks to the bottom. This indicates that the fermentation is over.

Standard specifications for the purity of raw linseed oil from North American seed (*Jour. Indus. and Engin. Chem.*, 6 (1914), No. 2, p. 164).—The American Society for Testing Materials has issued a compilation of the reports of the committee on preservative coatings for structural materials, from 1903 to 1913. Specifications for the purity of raw linseed oil from North American seed have been adopted, and raw linseed oil from North American seed must conform to the following requirements: Specific gravity at 15.5° C., 0.936 to 0.932, or at 25° 0.931 to 0.927; acid number 6; saponification number 195 to 189; unsaponifiable matter 1.5 per cent; refractive index at 25° 1.4805 to 1.479; and iodine number (Hanus) 178.

Methods of testing are described.

The analytical constants of hydrogenated oils, C. ELLIS (*Jour. Indus. and Engin. Chem.*, 6 (1914), No. 2, pp. 117–122).—The hydrogenation of oil changes the constants wherewith the fats and oils are usually partially identified to such an extent that identification is made much more difficult than heretofore. This article gives most of the available literature on the topic.

Hydrogenation of oils, C. ELLIS (*New York*, 1914, pp. X+340, figs. 145).—In addition to the hydrogenation of oils, the work deals with catalyzers and catalysis and the generation of hydrogen. Some of its contents are the analytical constants of hydrogenated oils, edible hydrogenated oils, uses of hydrogenated oils and their utilization in soap making, hydrogenation practice, the hydrogen problem in oil hardening, water gas as a source of hydrogen and the replacement of carbon monoxid by hydrogen, liquefaction and other methods for the removal of carbon dioxide, action of acids on metals, and miscellaneous methods of hydrogen generation.

The effect of pressure on certain micro-organisms encountered in preserving fruits and vegetables, B. H. HITE, N. J. GIDDINGS, and C. E. WEAKLEY, JR. (*West Virginia Sta. Bul.* 146 (1914), pp. 67, figs. 29).—The work previously noted (*E. S. R.*, 11, p. 583), which was done with milk, has now been extended to fruits (peaches, pears, blackberries, raspberries, plums, and tomatoes), vegetables (corn, peas, beans, beets, radishes, and potatoes), and grape and apple juice.

From the investigations it appears that pressure destroys the organisms largely responsible for the spoilage of sweet ripe fruits. In the case of grape juice a pressure of 100,000 lbs. for 10 minutes stopped fermentation. "Two samples inoculated with yeast were examined at the Boston Biochemical Laboratory as follows: An old sample fermenting rapidly when subjected to 75,000 lbs. for 30 minutes; a fresh sample receiving 25,000 lbs. for 16 hours. In each case an extended series of inoculation tests gave negative results. Inoculated with yeast after standing several years, the compressed samples fermented rapidly."

A pressure of 30,000 lbs. came to be regarded as the lowest that would probably be worth applying in practice.

Apple juice subjected to 60,000 to 80,000 lbs. for 30 minutes did not later develop gas and remained sweet. Two one-month-old samples were examined and found sterile. Apple juice kept for five years, after being subjected to a pressure of from 90,000 to 120,000 lbs., remained good and had an excellent odor and taste. Peaches and pears exposed to pressures of 60,000 lbs. for 30 minutes never spoiled, and samples kept for five years were in good condition. Plums also kept very well. Raspberries and blackberries usually underwent fermentation, and the samples which remained good were not always those subjected to a high pressure.

With tomatoes conditions were worse than with berries. "Only three samples are known to have been sterilized at ordinary temperatures, and they received 100,000 lbs. for 60 minutes on seven successive days. Of 30 samples subjected to 28,000 to 45,000 lbs. at 50 to 70° C. for from 30 minutes to 24 hours, all but five spoiled. These had received 40,000 lbs. at 70° for 60 minutes; 45,000 lbs. at 65° for 120 minutes; 40,000 lbs. at 65° for 160 minutes; 40,000 lbs. at 65° for 180 minutes; and 32,000 lbs. at 60° for 24 hours. Other samples receiving higher pressures for longer periods spoiled. There was nothing regular in the work with tomatoes."

Samples of vegetables treated spoiled. Compressed samples did not spoil as quickly as the check samples, however, but the decomposition was quite as offensive.

Experiments were also made with pure cultures of micro-organisms for the purpose of determining the following points: "(1) Whether or not a certain organism could be killed by such pressures as we could safely and easily apply; (2) the time pressure death point curve, that is, the relation between amount of pressure and length of time it is applied; (3) the effect of high and low temperatures on death point curve; (4) the effect of reaction of the media on death point curve." The organisms used were *Bacillus prodigiosus*, *B. fluorescens liquefaciens*, *B. lactis aerogenes*, *Streptococcus lacticus*, *B. subtilis*, *Saccharomyces cerevisia*, *S. albicans*, *B. typhosus*, and *B. diphtheria*.

While quite a few apparently contradictory results were obtained in the work, further investigation might eliminate nearly all of the contradictions. All of the results given are based on the ability of the micro-organisms to reproduce themselves. The value of the pressure method for the sterilization of culture media is pointed out. The technique and the apparatus employed in the tests are discussed in detail.

The coagulation of albumin by pressure, P. W. BRIDGMAN (*Jour. Biol. Chem.*, 19 (1914), No. 4, pp. 511, 512).—It was found that white of egg subjected to hydrostatic pressure of 5,000 atmospheres (75,000 lbs. per square inch) at 20° C. for 30 minutes becomes somewhat stiffened. At a little higher pressure, "6,000 atmospheres for 30 minutes produced a coagulation in appearance like curdled milk; while 7,000 for 30 minutes resulted in apparently complete coagulation, the white being capable of standing under its own weight. If the duration of the pressure of 5,000 was increased to one hour, the coagulation was only slightly increased in amount. Three thousand atmospheres applied for 16 hours produced a barely perceptible thickening of the white. The effect of temperature, which is not large, seems to be such that the ease of coagulation increases at low temperatures, contrary to what one might expect. Six thousand atmospheres applied at 0° for one hour produced a somewhat greater stiffening than would have been produced at 20°. Pressures considerably higher than 7,000 did not alter the effect."

The experiment was also tried with a pressure of 12,000 atmospheres for 20 minutes, but the resulting product was indistinguishable in appearance from that produced by 7,000, although at 20° it was high enough to compel the water to freeze to a modification of ice denser than water. "It is interesting that the coagulated white had not apparently been affected by this freezing."

The albumin was inclosed in a nickel-steel case and pressure transmitted to it by mercury.

METEOROLOGY.

The change in the climate and its cause, R. A. MARRIOTT (*London, 1914*, pp. 94, figs. 6).—This treatise predicates periodic variations in climate and the advance and recession of the polar ice sheet simultaneously in the arctic and

antarctic regions upon Drayson's theory that the earth has a second rotation besides the diurnal one, and that this secondary rotation has a cycle of 31,682 years during which the obliquity of the earth's axis varies from a minimum of $23^{\circ} 25' 47''$ to a maximum of $35^{\circ} 25' 47''$. According to this theory the earth is "now some 15,450 years removed from the height of the glacial period, when the contrast between summer and winter in temperate latitudes was inconceivably great and only 385 years removed from the position of minimum obliquity when the contrast between the seasons will be least."

Meteorological observations at the Massachusetts Agricultural Experiment Station, J. E. OSTRANDER and R. E. McLAIN (*Massachusetts Sta. Met. Buls.* 311, 312 (1914), pp. 4 each).—Summaries of observations on pressure, temperature, humidity, precipitation, wind, sunshine, cloudiness, and causal phenomena during November and December, 1914, are presented. The general character of the weather for November is briefly discussed, and the December bulletin gives a summary for the year. The principal data in this summary are as follows:

Pressure, reduced to freezing and sea level (inches).—Maximum, 30.78, November 29; minimum, 28.47, March 1; mean, 30.048. *Air temperature*, in ground shelter (degrees F.).—Maximum, 96.5, September 22; Minimum, —18.5, December 27. *Humidity*.—Mean dew-point, 36.6; mean relative humidity, 75.8. *Precipitation*.—Total rainfall or melted snow, 41.83; number of days on which 0.01 in. or more rain or melted snow fell, 118; total snowfall, 56.75 in. *Weather*.—Total cloudiness recorded by sun thermometer, 2,077 hours, or 47 per cent; number of clear days, 100. *Bright sunshine*.—Number of hours recorded, 2,377, or 53 per cent. *Wind*.—Prevailing direction, west-northwest; total movement, 55,455 miles; maximum daily movement, 488 miles, January 13; minimum daily movement, 1 mile, December 28; maximum pressure per square foot, 30 lbs., March 1, east. *Dates of frost*.—Last, May 16; first, September 28. *Dates of snow*.—Last, April 16; first, October 27.

Notes on the climate of historical times with a summary of mediæval weather phenomena, A. NORLIND (*Lunds Univ. Årsskr., n. ser., Sect. 1, 10* (1914), No. 1, pp. 55; *abs. in Geogr. Jour.*, 45 (1915), No. 1, p. 82).—A table containing available data regarding weather conditions in Europe during the period from 709 to 1499 is given with references to the original records from which the data were obtained. Certain outstanding climatic events, such as the freezing of the Baltic and Kattegat and the floods on the coast of Friesian Germany, receive particular attention. A detailed comparison is made of the winter and summer weather for each year for which there are data, between 1121 and 1310, and a chart based on ten-year averages of the succession of severe winters and moist cool summers is given.

It is shown, in general, that the summer was usually cold and wet when the winter was mild. A certain periodicity with winter maxima at intervals of 25, 45, 50, and 35 (?) years is also indicated.

While the data are considered insufficient to demonstrate the fact, the author is inclined to believe that the winter was formerly colder than at present, though to an insignificant extent. In general, the weather appears to have been practically uniform throughout the historic period; at least that there have been nothing more than very slight changes from the existing conditions.

[Meteorological observations in Canada], J. H. GRISDALE ET AL. (*Canada Expt. Farms Rpts.* 1913, pp. 3, 4, 16–19, 72, 76, 81, 82, 85, 88, 91, 92, 95, 103, 104, 113, 131, 134, 137, 160, 161, 175–177, 187, 190, 191, 218).—Brief summaries are given of weather conditions and of observations mainly on temperature and

precipitation during 1912 and a portion of 1913 at the various substations in different parts of Canada.

[Weather conditions in the British Isles in 1914] (*Nature* [London], 94 (1915), No. 2359, pp. 538, 539).—This is a brief note on a summary of weather conditions issued by the British Meteorological Office. It shows that there was an excess of temperature during the year in all parts of the British Isles, this excess being greatest in east and northeast England and in the midland counties. The highest temperature (90° F.) occurred in southeast England; the lowest (7°) in the east of Scotland. The rainfall was largest (49.31 in.) in the north of Scotland; and least (24.82 in.) in the northeast of England. The only districts with an appreciable deficiency of rainfall were the west and north of Scotland, 91 to 94 per cent of the average respectively. The greatest excess over the average was in southeast England. The distribution of rainy days was substantially normal. There was a slight excess of sunshine in the eastern districts, but about the average amount in the western districts.

Meteorology, J. W. LEATHER (*Rpt. Agr. Research Inst. and Col. Pusa, 1912-13, pp. 17-20, fig. 1*).—This is a brief note based upon observations at Pusa, Lyallpur, and Madras on evaporation from the water surface and on soil temperature.

The annual evaporation at the three places named was 6.4, 4.1, and 6.3 ft. respectively. This evaporation is much larger than that observed for fallow soil, which was approximately 28 in. at Pusa and 18 in. at Cawnpore. With a maximum air temperature of 110° F. it was found that the temperature of a fallow soil was 109° at 1 in. below the surface, 106° at 2 in., 102° at 3 in., and 97° at 6 in. Attention is called to the fact that in many places in India a maximum air temperature of 115 to 120° is regularly registered for some weeks during the hot season, and it is suggested that this may have an important effect upon biological changes occurring in the soil in accordance with the theories of Russell and Hutchinson.

Night radiation, I. Y. TOCHIDLOVSKIÏ (*Nochnoe Lucheispushkanie. Odessa, 1912; abs. in Zhur. Opytn. Agron. (Russ. Jour. Expt. Landw.), 14 (1913), No. 4, p. 443*).—The loss of heat during the night from different surfaces was studied by means of an Angström actinometer. It was found that a square centimeter of mowed grass lost 0.124 gram calories per minute, chernozem soil 0.120.

The fertilizing value of rain and snow, F. T. SHUTT (*Canada Expt. Farms Rpts. 1913, pp. 225, 265-268*).—"The total precipitation, as recorded at the Central Experimental Farm, Ottawa, for the year ending February 28, 1913, was 39.36 in., 9.62 in. falling in the form of snow. Analysis showed that this furnished 6.144 lbs. of nitrogen, per acre, in forms readily available for crop use. Records taken here indicate that the proportions of this amount furnished respectively by the rain and snow have not appreciably varied for the past four years, about eight-tenths of the nitrogen compounds being found in the rain."

SOILS—FERTILIZERS.

Petrography of various soils derived from volcanic ejecta, W. H. FRÿ (*Jour. Amer. Soc. Agron., 6 (1914), No. 4-5, pp. 164-171*).—Mechanical and mineralogical analyses of a number of soils definitely known to be volcanic ash or directly derived from lava are reported. It is stated that soils derived mainly from volcanic ejecta can be generally recognized by the presence of glass particles when such particles occur in noticeable quantities.

The data indicate that the soils examined fall into three general classes, namely, (1) very silicious soils containing large proportions of isotropic ma-

terial of low refractive index and associated with comparatively large proportions of quartz, (2) soils containing isotropic material of higher refractive index, relatively large proportions of olivine, and little or no quartz, and (3) soils characterized by the relatively larger number of mineral species readily recognized and by the occurrence of well-developed lime-soda feldspars. "The presence of relatively large proportions of glasses in certain soils derived mainly from volcanic ejecta . . . suggests that with such soils the inorganic soil material would be more readily and quickly modified than with soils of other origin."

Some unusual soils that occur in Oregon, M. M. McCool (*Jour. Amer. Soc. Agron.*, 6 (1914), No. 4-5, pp. 159-164).—This article deals with certain soils occurring in central Oregon which are characterized by a very loose more or less disintegrated pumice layer which extends to depths of from 8 to 12 in. The upper 4 in. is darker gray in color than the material underneath, and as a rule a very coarse pumice layer, which varies in thickness from 8 to 12 in., lies below the disintegrated mass. Beneath this layer to a depth of approximately 40 in. the texture is somewhat finer.

The results of physical and chemical studies of these soils show a high percentage of coarse gravel and fine and very fine sand in the upper layers, a low real specific gravity, an extremely high capillary water capacity, a high available water capacity, a low total content in soluble salts, and an abnormally high content of potassium, calcium, and magnesium. A mineralogical study shows that these soils are composed of material derived from both basic and acidic rock.

It is thought that little can be accomplished with these soils until the organic matter is materially increased and until mineral fertilizers are added.

The Hauraki Plains: Some notes on the soils, B. C. ASTON (*Jour. Agr. [New Zeal.]*, 8 (1914), No. 6, pp. 565-574, figs. 9).—A general description of the flora of the area and analyses of the soils are given. The latter show that the soils may belong to extreme types of clays, peats, and sands, and this is confirmed by the great diversity in the flora. "Improvement of the soils may be effected by liming the tenacious clays and claying the peaty soils." Experiments in mixing the abundant humus matters with clay soil and a systematic soil survey of the area are recommended.

Malayan rubber and coconut soils, M. BARROWCLIFF (*Agr. Bul. Fed. Malay States*, 2 (1914), No. 12, pp. 328-337).—This article presents the author's views obtained from an examination of rubber and coconut soils in the Malay States, and includes a number of analyses of good and poor soils.

Rubber is grown on various kinds of soil, but the most productive are stated to be the light sandy, well-drained soils composing the undulating lands broadening down from the granitic mountains and the flat peaty coast soils when these are well drained. The first are low in nitrogen and potash, but apparently contain enough for rubber. They are deficient in phosphoric acid, but apparently do not need lime. Perfect drainage and the presence of sufficient organic matter are soil conditions favorable to rubber cultivation.

Coconuts are grown on various kinds of soils, but apparently do especially well on the clayey peat lands of the coast. These soils contain considerable organic matter and are well supplied with nitrogen, potash, and phosphoric acid. They are infertile if poorly drained, but drainage needs to be less deep and thorough than for rubber. The heavy clays are not suited to either rubber or coconut culture.

The chemical or physical nature of colloidal aluminum silicates containing water, R. GANS (*Centbl. Min., Geol. u. Paläontol.*, 1913, Nos. 22, pp. 699-712; 23, pp. 728-741; *abs. in Chem. Zentbl.*, 1914, I, No. 3, pp. 286, 287).—In

opposition to Wiegner's conclusions (E. S. R., 28, p. 517), the author concludes that alkaline solutions of colloidal aluminum silicates containing water and also the zeolitic silicates of soils which may be decomposed by water or acids are chemical compounds since they maintain the same constant equivalent relations and by decomposition with water and in the exchange of ions with neutral salt solutions they act as chemical compounds. He further concludes that the zeolitic silicates of the soil consist mainly of aluminum silicates which in a fertile surface soil can only to a small degree disintegrate into mechanical mixtures of the gels of silica and alumina.

He also points out that Wiegner's adaptation of his experimental results to Freundlich's formula does not indicate that the colloidal aluminum silicates are absorption compounds since this formula does not always conform to experimental results. The terminology of the formula is in sharp contrast to the absorption maximum devised by Schmidt, and in the exchange process described by Wiegner the values inserted for the molecular equivalent concentration of the salt solution do not consider the existing exchanged matter of the silicates in addition to the unabsorbed substances yet in solution.

Considering the exchanged matter in the formula $Fk = \frac{C''}{C'} = \frac{\frac{x}{m}}{\frac{a}{g}}$ (F =the unknown,

k =the absorption factor, C'' =the concentration of the absorbing body in absorbed matter, and C' =the concentration of the salt solution), in which with an absorption compound no constant appears, the author obtained a constant. This he considers to be further proof that the ammonia absorption described by Wiegner is not physical surface attraction.

The chemical or physical nature of colloidal aluminum silicates containing water, G. WIEGNER (*Centbl. Min., Geol. u. Paläontol.*, No. 9 (1914), pp. 262-272; *abs. in Chem. Zentbl.*, 1914, I, No. 26, p. 2200).—In replying to the above criticism by Gans, the author questions the validity of the grounds upon which the Freundlich formula is challenged. He is also of the opinion that the chemical conception of the composition of aluminum silicates which he regards from a colloidal-physical viewpoint is inadequate.

The chemical or physical nature of colloidal aluminum silicates containing water, R. GANS (*Centbl. Min., Geol. u. Paläontol.*, 1914, Nos. 9, pp. 273-279; 10, pp. 299-306; *abs. in Chem. Zentbl.*, 1914, I, No. 26, p. 2200).—The author deduces further data to show that the assumption by Wiegner of an absorption process between aluminum silicates and neutral salt solutions is incorrect. He is of the opinion that the fact that the aluminum silicate absorbs the same quantity of the neutral salt out of solutions of different concentrations is sufficient proof of the chemical nature of aluminum silicates. This fact is thought also to contradict the assumption connected with the Freundlich formula that for each variation of the equivalent molecular concentration of the neutral salt solution there is a corresponding change in the absorption by the aluminum silicate.

Solution and absorption in the soil, E. A. MITSCHERLICH (*Landw. Jahrb.*, 46 (1914), No. 3, pp. 413-430, figs. 3; *abs. in Chem. Zentbl.*, 1914, II, No. 10, p. 655).—The author discusses those conditions of chemical reactions which govern solution and absorption phenomena in the soil, and concludes that solution and absorption constitute in the soil a cyclic process and are subject to the same laws. In proof of this he quotes the results of experiments by D. J. Hissink in which water saturated with carbon dioxide constituted the solution medium, clay soil the absorption medium, and ammoniacal nitrogen the body

to be absorbed or dissolved, and in which the quantities of nitrogen in a state of solution or absorption were observed when (1) with a constant quantity of nitrogen and of absorption medium the quantity of solution medium was varied, and (2) with a constant quantity of nitrogen and of solution medium the quantity of absorption medium was varied.

The results obtained were found by the author to conform, within the limits of error, to the mathematical law for absorption $f(X-x)=C-k.B$, where X is the maximum of absorbable nitrogen, x the salt absorbed at the time by the mass of soil B , and C and k are constants, and to the mathematical law for solution $f(y-a)=f(Y-a)-c.B$, in which y denotes the salts in solution in the given quantity of water with the existing mass of earth B , and Y , a , and c are constants. Since every law holds good only with constant temperature regardless of its degree, these laws are designated as absorption or solution isotherms.

In the author's opinion these equations afford an insight into the varying interaction between plant foods and water and soil, owing to the fact that they reveal the extent to which salts are reversibly or irreversibly dissolved or absorbed and thus disclose the maximum soluble and absorbable quantities and the saturation concentration of the solution under given constant conditions.

The effect of carbon dioxide on plant growth and soil formation, G. METTLER (*Ztschr. Sauerst. u. Stickst. Indus.*, No. 5 (1913), p. 193; *abs. in Chem. Ztg.*, 37 (1913), No. 104, *Repert.*, p. 469; *Chem. Abs.*, 8 (1914), No. 22, p. 3701).—The effect of carbon dioxide in the soil in promoting plant growth is attributed to the formation of the necessary carbon, nitrogen, and organic salts resulting from the increased activation of oxygen by the carbon dioxide. The author suggests the formation of carbon pernitrid, CN_2 , as a probable cause of the spontaneous combustion of coal beds.

The effect on plant growth of saturating a soil with carbon dioxide, H. A. NOYES (*Science*, n. ser., 40 (1914), No. 1039, p. 792).—It was found that this treatment was injurious to tomato and corn plants. "A carbon dioxide saturated soil upset the growth of these plants but did not change the soil so that the plant could not grow after its application was discontinued."

The proof of the origin of smoke acids in rain water flowing down tree trunks by means of an automatic separator and the influence of these acid waters on the soil, R. GERLACH (*Samml. Abhandl. Abgase u. Rauchschäden*, No. 9 (1914), pp. 47, pls. 6).—The author reports experiments with his so-called smoke and water separator in different localities with reference to the smoke content of the air, and also cropping experiments and soil investigations to determine the effect of rain water containing smoke acids on soil and vegetation.

The smoke and water separator is designed primarily to catch the rain water which runs down the trunks of trees, but may also be used in the open. The amount of flow of rain water down tree trunks was found to be large in many cases and varied according to the size and shape of the tree. For trees in leaf it averaged only about one-third of that for bare trees. The apparatus permitted the collection of rain waters from different smoke sections separately, the determination of the extent of their acidity by means of litmus paper and chemical analysis, and their separation according to the sources of the smoke.

In the cropping experiments the so-called smoke sickness of soil was first evidenced in a retardation of germination, particularly of fruit trees and the legumes vetch and beans. The legumes developed more slowly and sparsely and lived a shorter period in smoke-sick than in normal soils, while in the first year there was no apparent difference in the development of pine and fir evergreens. On discontinuing the use of water containing smoke acids and making

copious applications of pure rain water the more hardy grasses recovered from the effects of the smoke acids and continued to develop.

Analyses of certain soils in the neighborhood of railways and industrial works containing injured trees showed them to be acid, owing to the lime exhaustion by the smoke acids in the rain water. The trees with smoothest bark, which allowed great quantities of rain water to flow down into the soil, were the most injured. The deciduous trees were more injured than the evergreens, and of each type respectively the beeches and pitch pines were the most injured.

Analyses of the leaves of the experimental trees also served in most cases to indicate poisoning of the soil by smoke acids in rain water. Leaf poisoning in the evergreens was found to precede soil poisoning, while the reverse was true for deciduous trees. The smoke-sick evergreens utilized considerably less moisture than normal evergreens and the same was true to a less extent for deciduous trees. This is thought to aid in causing the neighboring soil to become acid and swampy.

See also previous notes by Gerlach and Haselhoff (E. S. R., 20, p. 831).

The partial sterilization of soils, E. J. RUSSELL (*Nature* [London], 94 (1914), No. 2351, pp. 308-311, figs. 4).—The author briefly summarizes the results of investigations by himself and his associates on the effect of partial sterilization of soil by means of heat, lime, and volatile antiseptics on the growth of plants and on the relation of protozoa thereto (E. S. R., 29, p. 730; 31, pp. 27, 420). The practical application of the results in greenhouse work is also discussed.

Inoculation for leguminous plants with especial reference to upland moors, A. DENSCH (*Mitt. Ver. Förd. Moorkultur Deut. Reiche*, 32 (1914), Nos. 10, pp. 237-245; 11, pp. 253-261).—This article includes a general discussion of this subject and also records comparative tests of various commercial cultures which proved to be worthless.

Green manuring, T. W. LONSDALE (*Jour. Agr.* [New Zeal.], 8 (1914), No. 5, pp. 475-479).—The importance and value of green manuring are briefly discussed and comparative tests of white mustard, Scotch vetch, crimson clover, partridge peas, and rye as green manuring crops are reported.

The results indicate the high value of white mustard for this purpose.

Green manures (*Bol. Agr.* [São Paulo], 15. ser., No. 6-7 (1914), pp. 525-527).—Analyses of five green manures are reported. As regards the quantity of organic matter and of fixed nitrogen produced they stood in the following order: *Canavalia gladiata*, *Arachis prostrata*, cowpeas, velvet beans, and peanuts.

Results of fertilizer experiments conducted at Summerville, S. C., T. E. KEITT (*South Carolina Sta. Bul.* 178 (1914), pp. 20).—This is a progress report on experiments at the Coast substation.

The most important fact established by these experiments is that phosphorus is the limiting element in fertilizers for corn and cotton on the soils of this substation. The relative value of different phosphates for supplying this deficiency is discussed, and acid phosphate is recommended as most profitable. Organic sources of nitrogen were more effective than inorganic.

The rational utilization of ammonia (*Chem. Trade Jour.*, 54 (1914), No. 1398, pp. 283, 284; *abs. in Chem. Ztg.*, 38 (1914), No. 92, *Repert.*, p. 430).—The industrial possibilities of the various processes for converting ammonia into nitric acid are discussed and it is concluded that none of them can be profitably used for the production of ammonium nitrate. "The best solution of the question, therefore, of producing nitrate of ammonia in the most rational and cheapest way would be to work a factory producing nitric acid by a direct process from the air in connection with an adjoining factory producing ammonia synthetically."

The conversion of ammonia into nitric acid or ammonium nitrate from an economic standpoint, E. DONATH (*Chem. Indus. [Berlin]*, 37 (1914), No. 17-18, pp. 513-516).—This article contains further discussion of the commercial possibilities of this process in addition to that noted above.

Lime and its uses on land, F. THOMPSON and A. E. GRANTHAM (*Delaware Sta. Bul.* 104 (1914), pp. 20, fig. 1).—The various lime compounds available for agricultural purposes are described and their use for fertilizing is explained.

The position of the fertilizer supply in south India, BERNARD (*Planters' Chron.*, 9 (1914), No. 46, pp. 697, 698).—In a brief discussion of the best and most available sources of supply of phosphates, potash, and nitrogen for use in this region, it is stated that a process has been perfected for the preparation of a double sulphate of potash and lime containing 25 per cent of potash which is intended for use as a substitute for pure potash salts.

Sewage disposal and use of tannery wastes, C. C. SMOOT, III (*Jour. Amer. Leather Chem. Assoc.*, 9 (1914), No. 12, pp. 523-525).—An average analysis of tannery sewage sludge after treatment with spent lime and the ashes of spent tanning materials showed nitrogen 0.84 per cent, lime 46, phosphoric acid 0.34, and potash 0.62. This sludge is especially recommended for the fertilizing of fruit trees.

Fertilizer and oil manufactured from dog fish, E. E. YOUNG (*Daily Cons. and Trade Rpts. [U. S.]*, 17 (1914), No. 305, p. 1373).—Brief reference is made to three reduction plants at Canso and Clarke Harbor, Nova Scotia, and at Shippigan, New Brunswick, established primarily for the purpose of utilizing dog fish in the manufacture of fertilizer and oil, thus reducing the damage to the deep-sea fisheries from this source.

The three plants work up from 5,000 to 6,000 tons of dog fish annually, producing from 500 to 600 tons of fertilizer and about 25,000 gal. of oil. The supply of dog fish, however, is very uncertain, being abundant at certain seasons and very scarce at others. As a result, the factories have been obliged to supplement the supply of dog fish with fish offal of other kinds.

Fertilizing materials, F. T. SHUTT (*Canada Expt. Farms Rpts.* 1913, pp. 245-259).—Analyses of the following materials are reported and discussed: Marl; limestone; limekiln ashes; gypsum and like substances; wood ashes; potash residue from oxygen-acetylene plant; marsh, river, and oyster muds; mucks; infusorial earth; lobster refuse; dog fish scrap; and nitrate of lime.

[Fertilizer production, exports, and imports of the United States, 1912-13], compiled by W. T. THOM (*U. S. Geol. Survey, Mineral Resources of the United States, Calendar Year 1913, pt. 1, pp. CXXXV, CXXXVIII*).—On the basis of data collected by the U. S. Geological Survey it is stated that "the production of lime in 1913 was 3,595,390 short tons, valued at \$14,648,362, against 3,529,462 short tons, valued at \$13,970,114, in 1912. . . . The imports for consumption in 1913 were 4,139 short tons, valued at \$48,538, against 4,268 short tons, valued at \$48,153, in 1912. The exports reported were valued at \$212,345 in 1913 and \$199,515 in 1912. . . .

"The total commercial marketed production of phosphate rock reported to the Survey in 1913 amounted to 3,111,221 long tons, valued at \$11,796,231, compared with 2,973,332 long tons, valued at \$11,675,774, in 1912. . . . The total quantity of phosphate rock reported as mined during 1913 was 3,152,208 long tons, against 3,190,587 long tons in 1912. The imports for consumption of crude phosphate, guano, kainit, manure salts, etc., in 1913, were valued at \$10,819,253, against \$8,893,090 in 1912. The exports of phosphate rock in 1913 were 1,366,508 long tons, valued at \$9,996,580, against 1,206,520 long tons, valued at \$8,996,456, in 1912. . . .

"There was no actual production of potash salts in the United States in 1913. The imports of potash salts in 1913 were valued at \$10,793,913, against \$10,692,285 in 1912. . . .

"The imports of sodium nitrate for consumption in manufacture of fertilizers and other chemical products amounted in value to \$21,630,811 in 1913, against \$16,544,511 in 1912."

The international movement of fertilizers (*Internat. Inst. Agr. [Rome], Mo. Bul. Agr. Intcl. and Plant Diseases*, 5 (1914), No. 9, pp. 1101-1142).—This is the first of a series of half-yearly reports (to appear March 1 and September 1 of each year) authorized by the last general assembly of the International Institute of Agriculture at Rome, the purpose of which is to give statistics of production, imports and exports, consumption, and prices of phosphatic, potassic, and nitrogenous fertilizers. This number is dated September 1, 1914, and gives statistics for the year 1913 as compared with 1912 and also some data for the first half of 1914.

It is stated that the world's production of natural phosphates in 1913 was 6,600,458 metric tons as compared with 6,888,908 tons in 1912, the largest producers being the United States, 3,202,636 tons; Tunis, 2,284,678 tons; Algeria, 438,601 tons; and France, 335,000 tons. The production of basic slag was 4,246,000 tons; and the production of German potash salts, 11,607,510 tons of crude salts and 1,647,906 tons of refined salts. The amount of potash salts sold for agricultural purposes, calculated as actual potash (K_2O), was 1,003,913 tons, of which 536,102 tons was used in Germany. The figures for slag and potash salts show substantial increases in 1913 over 1912. Of the potash salts used for agricultural purposes 749,000 tons, calculated as actual potash (K_2O), was used in Europe and 242,283 tons in America. The production of Chilean nitrate is given as 2,586,975 tons in 1913 as compared with 2,773,459 tons in 1912. The total consumption of nitrate of soda in 1913 was 2,556,971 tons; the amount used for agricultural purposes was 2,098,230 tons. The production of sulphate of ammonia was 1,448,400 tons in 1913 as compared with 1,306,600 tons in 1912, the largest producers of this material being Germany, 549,000 tons; the United Kingdom, 425,700 tons; and the United States, 176,900 tons. The 1913 figures for each of these countries represent a decided increase over those for 1912. The amount of sulphate of ammonia used for agricultural purposes in 1913 was 1,210,550 tons. It is estimated that calcium cyanamid was produced in 1913 to the extent of 114,093 tons and Norwegian nitrate to the extent of 70,000 tons. It is stated that 6,229,777 tons of fertilizers was consumed in the United States (including Alaska and Hawaii) in 1913.

Statistics of production and consumption of crude sulphur and sulphate of copper are included with those for fertilizers.

AGRICULTURAL BOTANY.

Fundamentals of plant breeding, J. M. COULTER (*New York and Chicago*, 1914, pp. XIV+347, figs. 109).—This book is intended as an interpretation of recent advances in plant breeding for those who wish a simple statement of evolution and heredity or information concerning plant breeding and some of the fundamental principles underlying agriculture.

After discussing variation in plants, theories of evolution, etc., the author describes some of the methods by which breeding is carried on. Chapters are devoted to Mendel's law and recent progress in genetics, the progress in breeding plants resistant to drought and plant diseases, relation of forestry to the subject, rôle of soil, etc. Condensed accounts are given of the work of this

Department and the various experiment stations at home and abroad in the introduction and improvement of plants.

The author considers food production to be one of the most fundamental material problems of the day, and thinks this situation is being met or may be met by a better understanding of the principles of plant breeding and their extension to ordinary farm practice.

A contribution to a knowledge of the mutating *Oenotheras*, R. R. GATES (*Trans. Linn. Soc. London*, 2. ser., Bot., 8 (1913), No. 1, pp. 67, pls. 6).—In this paper the author has sought to bring together and organize certain results of experimental work which he has carried on with *Oenothera* during six years, as bearing upon the problem of the origins of the forms in question and the factors involved.

He concludes that the explanation of the mutation phenomena in *O. lamarckiana* is by no means simple, but that while a full understanding of the nature and cause of this behavior has not yet been reached, the facts known lead to the view that the previous crossing of this species in the wild condition or in botanical gardens, or both, has been the chief cause of the germinal disturbances which manifest themselves in the appearance of mutants. The cause of mutation is thought to be internal to the organism itself. Two types of mutation are considered, those occurring in pure lines and those following ancestral mixture of germ plasms.

It is held that there is between mutations and fluctuations no distinction more fundamental than the facts that the one is inherited and the other is not, one being due to a germinal alteration, the other to a somatic variation. A bibliography is appended.

Inheritance in plant hairs, J. BELLING (*Jour. Heredity*, 5 (1914), No. 8, pp. 348-360, figs. 11).—Characters of the downy growth on pods of several varieties of velvet beans as modified for several generations by crossing are figured and described, segregation ratios are given, and a working hypothesis is elaborated.

Immunity to fungus diseases as a physiological test in genetics and systematics, exemplified in cereals, N. I. VAVILOV (*Jour. Genetics*, 4 (1914), No. 1, pp. 49-65).—This examination of evidence regarding the behavior of hosts toward fungi, as influenced by degrees of relationship between the hosts, concludes with the statement that the degree of sensitiveness of reaction of fungi with cereals up to the present time is not exceeded by that of the so-called serum methods applied to plants, while the former is much simpler in its application. A bibliography is appended.

Fasciation, M. A. BRANNON (*Bot. Gaz.*, 58 (1914), No. 6, pp. 518-526, figs. 7).—The author describes some examples of fasciation observed by him in North Dakota which are thought to have a bearing on the study of normal morphological structures, and also to be of interest by reason of the physiological relation existing between increased sap pressure and the disturbed balance of forces which are believed to be responsible for cottonwoods and willows undergoing a change from radial to more or less bilateral symmetry during the first three seasons of their growth.

The transpiration of emerged water plants: Its measurement and its relationships, C. H. ORIS (*Bot. Gaz.*, 58 (1914), No. 6, pp. 457-494, figs. 17).—From a study of a considerable number of aquatic plants, the author found that emerged water plants transpire large amounts of water. With one exception (the water lily) the evaporation taking place from a water surface occupied by emerged plants is much greater than that taking place from a free water surface of the same area under the same external conditions. The amount of evaporation from a water surface occupied by emerged plants depends on the

species of the plant, the density of the stand, the amount of plant surface exposed to the evaporating power of the air, the height of the plant above the level of the water, external factors, such as wind, temperature, and relative humidity, and internal factors, as chemical and physiological phenomena occurring within the plant. Transpiration from emerged plant surfaces goes on continuously, but during the day it is greater than at night. No constant ratio was found between the rate of transpiration and the area of surface exposed in different species of plants.

The data given are considered of economic importance as indicating what plants should be grown in and what plants should be excluded from storage reservoirs in regions of small rainfall and scant water supply.

Chemical modifications of plant organs undergoing autofermentation, M. MOLLIARD (*Compt. Rend. Acad. Sci. [Paris]*, 159 (1914), No. 12, pp. 512-514).—Sections of squash tissue were kept under sterile conditions and the changes in sugars and nitrogenous content noted under both aerobic and anaerobic conditions.

The author states that the sugars are much more quickly used up under aerobic conditions and that the loss in weight corresponds closely to the loss in sugar. Amin nitrogen was found to remain practically constant in the specimens in air but to increase under anaerobic conditions. Amid nitrogen quickly disappeared in both sets of tubes. Ammonia increased in both, but more rapidly in the confined air. He claims that autofermentation may be distinguished by the method by which sugars are utilized as well as by the transformation of the nitrogenous materials.

Assimilation of colloidal iron by rice, P. L. GILE and J. O. CARRERO (*U. S. Dept. Agr., Jour. Agr. Research*, 3 (1914), No. 3, pp. 205-210).—Previous work (E. S. R., 26, p. 121; 31, p. 816) having shown that pineapples and upland rice were affected with chlorosis when grown on calcareous soils and that the failure of the plants to make successful growth seemed to be due to diminished assimilation of iron, the authors conducted a series of experiments to test the possibility of the assimilation of colloidal iron by rice.

The plants were grown in flasks, and where no iron was given they were strongly chlorotic. Those plants receiving dialyzed iron or ferric chlorid in the absence of a nutrient solution were also chlorotic, although somewhat greener than the check plants, and the chlorosis was later in appearing. Where ferric chlorid was added to a nutrient solution the plants were of a normal green color.

The general conclusions drawn from the work are that rice can not assimilate colloidal iron. The toxicity of ordinary distilled water or ferric chlorid solutions was not overcome in the experiments by supplying other roots of the same plant with a balanced solution. The toxicity of the ferric chlorid solution was accompanied by penetration of iron into the root and transportation to the leaves.

Oil content of seeds as affected by the nutrition of the plant, W. W. GARNER, H. A. ALLARD, and C. L. FOUBERT (*U. S. Dept. Agr., Jour. Agr. Research*, 3 (1914), No. 3, pp. 227-249).—A study was made of the formation of oil in seeds of cotton, soy bean, peanuts, and sunflower, as affected by various environmental and other factors. While the experiments were conducted with these different plants, the deductions are mostly drawn from the experiments with soy beans, the other plants in the main appearing to confirm them.

It was found that except for the period immediately following blooming and that directly preceding final maturity there was a fairly uniform increase in oil content throughout the development of the seed and that there was no critical period of very intense oil formation at any stage of the development. As

a consequence of the physiological relationship of the oil to carbohydrate it is considered that maximum oil production in the plant requires conditions of nutrition favorable to the accumulation of carbohydrate during the vegetative period and to the transformation of carbohydrate into oil during the reproductive period.

After discussing the various factors influencing oil formation the authors conclude that under practical conditions climate is a more potent factor than soil type in controlling the size of the seed and its oil content. Within ordinary limits the relative fertility of the soil appears to be a minor factor in influencing the size of the seed and its oil content. In fertilizer tests with cotton the addition of a complete fertilizer usually gave larger seed and a higher percentage of oil. Increased applications of nitrogen did not affect the size of the seed, but lowered the percentage of oil, while increasing the applications of phosphorus or potash did not affect either character. In pot cultures with soy beans the addition of phosphorus did not change the size of the seed, but increased the oil content. Potash was without decided effect. In similar tests with peanuts neither phosphorus nor potash affected the oil content.

The relation of food supply to fungus development, E. G. PRINGSHEIM (*Ztschr. Bot.*, 6 (1914), No. 7, pp. 577-624, figs. 5).—The author describes a somewhat extended study of the relations between the volume and concentration of the food supply, also of the effect of ordinarily more or less poisonous materials therein, and the development of several fungi.

It is stated that while growth shows within limits a correspondence with volume and concentration in case of a given fungus and medium, variations in growth rate are different for the various organisms employed. Such correspondence may be extended beyond the original limits by the addition of ordinarily poisonous substances in the limited proportions within which these exert a stimulative influence. The influence of a given nutritive factor in a given medium is affected by the amount of other nutritive materials present. A given increase in the percentage of a nutritive substance, which is standing at its minimum proportion, causes a greater increase in growth than does the corresponding addition of a merely stimulating substance, which fact furnishes a means of distinguishing between nutrients and stimulants.

The pigments of *Fusarium*, BEZSSONOFF (*Compt. Rend. Acad. Sci. [Paris]*, 159 (1914), No. 8, pp. 448-450).—A study of *F. orobanchis* is reported in which the author found two pigments, one a yellowish color, belonging to the anthocyanin group and soluble in water and alcohol, and the other a red pigment, considered to be carotin.

Chondriosomes and anthocyanin pigment in vegetable cells, A. PENSA (*Anat. Anz.*, 45 (1913), No. 4, pp. 81-90, figs. 2).—The author, claiming to have shown in a series of studies that in vegetable cells chloroplasts are formed showing much the same morphological and chemical characters as do chondriosomes, discusses several articles confirmatory or critical of his views by other authors.

More concerning chondriosomes and anthocyanic pigments in vegetable cells, A. PENSA (*Anat. Anz.*, 46 (1914), No. 1-2, pp. 13-22, figs. 2).—Discussing some differences between his own views, based upon the work above noted, and the conclusions of Guilliermond (*E. S. R.*, 29, p. 827), the author examines the latter in connection with some observations made by himself.

On a supposed synthesis of anthocyanin, MURIEL WHELDAL and H. L. BASSETT (*Jour. Genetics*, 4 (1914), No. 1, pp. 103-107).—This is a critical discussion of a paper by Everett (*E. S. R.*, 31, p. 626).

Electrical injuries to trees, G. E. STONE (*Massachusetts Sta. Bul.* 156 (1914), pp. 19, pls. 5, figs. 3).—The author describes a number of kinds of electrical

injuries to trees, including a brief discussion of the electrical resistance in trees, as well as the effects of alternating and direct currents, lightning, and earth discharges, and suggests methods of preventing injuries to trees from electric wires.

It is stated that the effects of alternating currents on trees are local, producing injury only near the point of contact with the wire. In the author's opinion an alternating current does not cause the death of the tree, although it may burn or disfigure it to a considerable extent. Most of the injury by electric currents is said to be from direct currents used in operating electric railroads. In all the experiments conducted the injury was found to be due to the effects of heat generated by the current, and the maximum current for each individual plant was found to vary considerably.

It is said that there is practically little or no leakage from wires during dry weather, but that more or less occurs during wet weather, when a film of water is formed on the bark and if insulation of the wires is not sufficient. While no authentic cases of killing trees by either the alternating or direct current as usually employed are reported, it is claimed that the reversal of the polarity in electric railway systems has resulted in destroying a number of trees. The natural high resistance offered by trees and plants in general is said to serve as a protection against severe injury from lightning and contact with high tension wires. The least resistance in a tree occurs in the cambium and adjacent tissues. There seems to be evidence to support the idea that a direct current of insufficient strength to cause burning may electrolyze the cell contents and later result in the death of the tree. The author claims that earth discharges during thunderstorms are more common than generally supposed and are known to disfigure and cause the death of trees.

Department of botanical research, D. T. MACDOUGAL (*Carnegie Inst. Washington Year Book*, 12 (1913), pp. 57-87, pls. 2, fig. 1).—This is a progress report of the investigations carried on by the director and various assistants at the laboratories of the Carnegie Institution situated at Tucson, Ariz., and elsewhere. The investigations include a study of the Salton Sea, its geological, chemical, and biological aspects; alterations induced by ovarial treatments of plants; evolution of the chrysomelid beetles; root variation in desert plants (*E. S. R.*, 30, p. 827); root characters of trees grown in the coastal climate of California; the transpiration behavior of rain-forest plants; the water relations of plants; autonomic movements of stems of *Opuntia*; the transpiration of desert trees; photolytic effect of blue-violet rays and their variations in solar radiation; acidity, gaseous interchange, and respiration of cacti; fruit development in the Cactaceæ; and the relationships and distribution of the Cactaceæ.

FIELD CROPS.

Agriculture, W. SOMERVILLE (*London, New York, and Toronto*, [1913], pp. VII+256).—This volume discusses from the British point of view the fundamental principles underlying the practice of agriculture under the topics of formation, properties, types, and improvement of soils; principles and use of manures; rotation of crops; and seeds.

The key to successful farming, J. KASMEIER (*Shawnee, Okla.*, 1913, pp. 143, figs. 69).—In this book the author gives his experiences and describes the methods he used, which were based on four essentials, viz, preserving the rainfall and moisture, fertilization, subsoiling, and care of the plant roots. The results of these methods applied to cotton, corn, potatoes, alfalfa, wheat, oats, tomatoes, sweet potatoes, orchards, and forestry are given, with supplemental suggestions.

Parsons on dry farming, E. R. PARSONS (*Aberdeen, S. Dak., 1913, pp. 188, pls. 10, figs. 3*).—About half of this book is devoted to soil conditions and to methods to be employed in the dry farming section, while the remainder treats of field and garden crops best suited to semiarid regions, with a chapter each on fruits and forestry.

Handbook of breeding of agricultural plants, C. FRUWIRTH (*Handbuch der landwirtschaftlichen Pflanzenzüchtung. Berlin, 1914, vol. 1, 4. rev. ed., pp. XXIII+442, pls. 8, figs. 86*).—An enlarged and revised edition of the volume previously noted (E. S. R., 21, p. 543).

The work of the Belle Fourche reclamation project experiment farm in 1913, B. AUNE (*U. S. Dept. Agr., Bur. Plant Indus., Work Belle Fourche Expt. Farm, 1913, pp. 1-7, 9-15, 17, figs. 2*).—This reports the continuation of the work in South Dakota previously noted (E. S. R., 29, p. 31), and gives meteorological operations, and results of rotations with alfalfa, sugar beets, clover, flax, oats, wheat, barley, corn, and potatoes, as well as of continuous cropping with each. It is stated that 32 different cropping systems are being tested, some of which are under irrigation.

It is noted that late irrigation appeared to prevent flax from ripening evenly, and it starts new branches from the lower joints. In experiments on the rates of seeding alfalfa, 14 different rates ranging from 2.5 to 25 lbs. per acre, it was found that the percentage of seed-producing plants ranged respectively from 18 to 3. In regard to the time and methods of seeding alfalfa "the early-seeded alfalfa yielded somewhat more than that seeded late. Assuming that the price of wheat hay is the same as that of alfalfa hay, about \$5 a ton, planting with a nurse crop and harvesting the wheat as hay gave larger returns per acre than planting the alfalfa alone. When the cost of harvesting and thrashing the wheat for grain is considered, it is seen that this method is less profitable than either of the two methods previously mentioned, for the yield of 28.2 bu. per acre is little more than sufficient to pay the cost of production on irrigated land. The returns for the row plantings were the smallest obtained in the experiment. It should be remembered that these statements apply to the first year's results only."

One year's results in the use of flax as a nurse crop for alfalfa showed that "considering the cost of culture during the year, the net value of the crop obtained where flax was used as a nurse crop was slightly higher than that of the alfalfa planted alone."

Yields of alfalfa indicated no important effect of late-fall or early-spring irrigation. Fall irrigation for flax culture showed no advantage in point of yield.

In time-of-plowing experiments for oats, it was found that it was not a desirable practice to plant oats on land during the same spring in which the land was plowed.

A variety test with corn, a cultural test with mangels, and the beginning of trials of different pasture-grass mixtures are mentioned.

The result of the first year's test in soil dynamiting on yield of oats gave 18.4 bu. per acre on the dynamited plat and 25.9 and 24.1 bu. on check plats on either side.

Forage crops, T. S. PARSONS (*Wyoming Sta. Bul. 104 (1914), pp. 11-22, figs. 3*).—This bulletin gives cultural methods for legumes, grasses, and miscellaneous forage crops, and from trials ranging up to four years concludes that "peas and oats give the best results under all conditions for either hay or silage. Barley, rye, emmer, or oats may be sown to advantage with peas. For late sowing, barley is best. Six to eight tons of peas and oats in the green

state can be raised on an acre under the best conditions. Four to five tons per acre make it a paying crop.

"At altitudes below 5,000 ft. corn can be raised successfully for silage or fodder at least. White sweet clover makes a good crop where alfalfa can not be grown. Stock eat it readily. It will not become a pest if not allowed to go to seed. Soy beans and cowpeas can probably be grown successfully in the lower altitudes of the State. The vetch may be substituted for peas with oats under some conditions but peas are usually better yielders. The winter vetch (*Vicia villosa*) may be sown with winter rye on the dry farm to good advantage."

[Field crops work at the Canadian experiment stations and farms in 1912], J. H. GRISDALE ET AL. (*Canada Expt. Farms Rpts. 1913*, pp. 29-31, 39, 40, 43-47, 49, 51, 53-55, 62, 63, 66-69, 75, 82, 86, 89, 96, 97, 101, 102, 106, 123-130, 132, 133, 135, 136, 138-160, 162-174, 178-187, 188, 189, 192-217, 222, 224, 227, 228, 242-245, 303, 304, 310-312, 316, 317, 336-338, 347, 360-362, 365, 370-373, 380, 391, 392, 401, 413-473, 493, 494, 619-669, 693-698, pls. 6).—This continues the report of work previously noted (E. S. R., 29, p. 222).

On the various farms the results of manurial, cultural, or varietal tests have been reported with potatoes, wheat, barley, oats, peas, sugar beets, maize, red clover, alfalfa, timothy, tobacco, turnips, mangels, flax, emmer, spelt, field beans, rye, buckwheat, carrots, orchard grass, broom corn, brome grass, English blue grass, western rye grass, canary grass, Kentucky blue grass, redbud, alsike clover, and white Dutch clover. Analyses of sugar beets and cooking tests of potatoes are also included.

As a result of a study of the influence of environment on the composition of wheat and barley it is stated that "this research, inaugurated in 1905, and continued since that date, has shown that soil and seasonal conditions may markedly affect the composition of wheat and barley. For the past three years, wheat from the same stock has been grown on the larger number of experimental farms and stations from Prince Edward Island to British Columbia, and the harvested grain analyzed. The data obtained in a very large measure confirm those of previous seasons from similar experiments conducted in the northwestern provinces only, and go to show that a moderately dry soil, accompanied by high temperatures during the period in which the grain is filling, tend to arrest the vegetative growth of the plant, to hasten maturity and conduce to a hard berry, with a high percentage of gluten and high baking value. It would seem from this investigation that the excellent quality of northwestern-grown wheat is due in part, at least, to climatic conditions which prevail during the later summer months over large areas in the grain-growing districts, and which bring about a quick maturation of the grain."

The commencement of breeding experiments to improve certain characters of timothy, red clover, and orchard grass is noted. Results of a 2-year test of planting on nonirrigated land seed potatoes grown on irrigated and nonirrigated land showed those grown on irrigated land to be superior in yielding qualities. Potatoes in variety tests yielded much heavier under irrigation than when grown on nonirrigated land. In spraying tests with nine varieties, the total yield per acre was 226 bu. 12 lbs. with Bordeaux mixture, 163 bu. 36 lbs. with lime sulphur, and 156 bu. 48 lbs. with the check.

Cooperative experimental work with winter cover crops, F. G. TARBAX, JR. (*South Carolina Sta. Circ. 26 (1914)*, pp. 3-23, figs. 7).—This circular discusses the value of bur clover, crimson clover, vetch, and rye as winter cover crops, and gives methods of production and results of cooperative work with farmers since 1910. "Numerous reports from farmers show that success has been achieved in nearly all cases where farmers have understood conditions under

which cover crops should be grown and have persevered in planting them, each year correcting previous mistakes."

Development of the culms of grasses, R. S. HOLE ([*Indian*] *Forest Bul.* 25 (1914), pp. 13).—In this study two periods of growth of the grass culms have been recognized, (a) a preparatory period of slow growth usually characterized by short internodes carrying scales or undersized leaves, (b) a subsequent period of vigorous growth characterized as a rule by long internodes carrying well-developed leaves. With these growth periods in view the experiments here described have brought out the following results:

"In wheat the periods of preparatory and vigorous growth, respectively, are well distinguished by the lengths of the internodes. In the average primary culm the same number of leaf-bearing internodes is produced in both these two stages of growth, but the period of preparatory growth is approximately three-fourths of the period of vigorous growth.

"The average number of long leaf-bearing internodes produced in the primary culms is approximately equal to the number of months in the period of vigorous growth, [and] is practically the same whether calculated from the primary culms alone, from the axillary culms alone, or from a mixture of these as found in the final crop.

"In the older axillary culms both growth-periods (but more especially the preparatory period) are shorter than those of the primary culms, and there is little difference between the two classes of culms as regards the date of ripening grain. The number of leaf-bearing short internodes is approximately half the number of the long leaf-bearing internodes and the preparatory period of growth is approximately half the vigorous growth-period."

The composition and quality of wheat grown in mixtures with oats, C. H. BAILEY (*Jour. Amer. Soc. Agron.*, 6 (1914), No. 4-5, pp. 215-217).—This article gives some results of an experiment carried on at the Minnesota Station and shows that "wheat grown in mixtures with oats did not vary in composition and quality from that grown alone. The flour milled from such wheat contained practically the same percentage of crude protein and gluten, and exhibits nearly the same baking strength. The slight variations in these properties which were found are no greater than were found in duplicate samples from adjacent plats of wheat treated identically alike."

Percentage of protein in nonlegumes and legumes when grown alone and in association in field mixtures, J. M. WESTGATE and R. A. OAKLEY (*Jour. Amer. Soc. Agron.*, 6 (1914), No. 4-5, pp. 210-215).—Analyses of 19 samples of nonlegumes obtained from fields of normal fertility in several different States, and under the conditions typical of the surrounding sections, when grown with legumes showed variations in protein content ranging from 2.02 per cent above to 2.61 per cent below that when grown alone.

A study of the protein content of wheat and clover grown in the same field but mixed in different proportions showed that under the particular conditions present not only was the protein content of the wheat slightly reduced by the association with clover, but that the percentage of protein in the clover itself was decreased as the proportion of wheat in the mixture increased. The authors therefore concluded "that the phenomenon of increased protein content in the nonlegume by reason of its association with the legume is not so universally true as to make it safe to advocate the method unreservedly as a means of increasing the production of protein upon the farms of this country."

The cultivation of legumes, C. FRUWIRTH (*Anbau der Hülsenfrüchte. Berlin, 1914, 2. rev. ed., pp. IX+253, figs. 73*).—The first part of this book treats of the general characteristics of legumes and conditions affecting their growth. The second part gives descriptions and cultural methods of 24 legumes.

Culture experiments with bacterial inoculations of lupine and alfalfa, C. BARTHEL (*Meddel. Centralanst. Försöksv. Jordbruksområdet*, No. 95 (1914), pp. 32, pls. 2; *K. Landtbr. Akad. Handl. och Tidskr.*, 53 (1914), No. 4, pp. 251-280).—Different methods of preparing pure cultures of nitrogen-fixing bacteria for various legumes are discussed and results of field applications of various commercial forms of pure cultures and of soil containing the desired bacteria are given. Work for 1911, 1912, and 1913 is reported. In general the method of using soil containing bacteria showed better results in larger yields of green forage than did the use of azotogen or Barthel's culture.

A statistical study of barley at the Dickinson (N. Dak.) substation, J. A. CLARK (*Jour. Amer. Soc. Agron.*, 6 (1914), No. 4-5, pp. 171-190).—The experiments discussed are cooperative between the Office of Cereal Investigations of this Department and the North Dakota Experiment Station, and are for the purpose of determining the relative yielding power of different varieties and to find reasons for the existing variations in yields between the different groups of varieties of the same cereal. Both plat and nursery experiments are reported.

The work centers around three groups of varieties, 2-rowed hulled, 6-rowed hulled, and 6-rowed naked, and covers several years. In discussing the annual and average yields of three varieties of barley representing the three groups, respectively, for eight years, 1906-1913, as representing the results of plat experiments, it is stated that the 2-row variety outyielded the 6-row variety in all years, and the naked variety in all years except 1906. It had an average yield of 34.2 bu. compared with 26.1 bu. for the 6-row variety and 25.6 bu. for the naked variety.

In the nursery work it is shown that for a five-year period the mean yield of the 2-rowed hulled group of barley equaled 296.2 ± 7.4 gm. and the next highest yielding group, the 6-rowed hulled barleys, had a mean yield of 207.1 ± 5.7 gm. The naked group had the lowest yield, 204.7 ± 5.1 gm. The yields of straw are given as 597.6 ± 10.5 , 389.7 ± 18.2 , and 400.7 ± 9.3 gm., respectively. From the data given there appears to be little or no advantage for any one of the three groups in regard to the percentage of grain.

Height of plants, heads per plant, length of head, and growing period in days were studied and comparisons made as to yield factors. The following summary is given as a result of this statistical study of barley:

"The 2-row hulled group exceeds the 6-row hulled group in yield of grain by 43 per cent; in yield of straw by 49.1 per cent; has no significant difference in percentage of grain in plant or in height of plant; produces per plant 51.5 per cent more heads, of 55 per cent greater length, and requires a growing period 7.3 per cent longer. The 2-row hulled group exceeds the 6-row naked group by 44.7 per cent in yield of grain and 53.3 per cent in yield of straw; has no significant difference in percentage of grain in the plant; produces 67.8 per cent more heads, averaging 40.9 per cent longer, and has a growing period 7.1 per cent longer. On the other hand, the plants of the 6-row naked group average 6.9 per cent taller than those of the 2-row hulled group. The 6-row naked group has plants 8.1 per cent taller and heads 10 per cent longer than those of the 6-row hulled group.

"The greater yield of both grain and straw in the 2-row hulled group is accounted for, in part, by the greater number of heads per plant, the longer heads, and a longer growing period. The greater number of heads per plant is considered the most important factor."

Notes on the selection of maize at Cambodia, M. DE FLACOURT (*Bul. Econ. Indochine*, n. ser., 17 (1914), No. 107, pp. 215-218).—This article discusses work

in progress as to improving the yield and earliness of corn by the selection of seed from plants that bear normal ears on suckers.

Detasseling of maize Giant of Serbia, E. HECKEL (*Compt. Rend. Acad. Sci. [Paris]*, 159 (1914), No. 16, pp. 595-597).—This gives results of work along the line of that previously noted (E. S. R., 28, p. 225; 31, p. 44).

The data show that by removing the tassel soon after it has expanded and fertilization of the ear has been assured, a somewhat higher content of saccharose and glucose was secured in the juice of the plant up to the early part of September, after which date it declined rapidly. A wide variation of this property to store up sugar was observed in individual plants. It is noted that the starch content fluctuated with the sugar content in the detasseled plants.

Results with fertilizers for maize, M. CALVINO (*Bol. Soc. Agr. Mexicana*, 38 (1914), No. 41, pp. 805-809).—Two tests carried out in the federal district of Mexico show the advantage secured with commercial fertilizers, especially with sulphate of ammonia. With bone meal, sulphate of potash, and gypsum there was an increase in grain over the untreated plat of 10.3 per cent in one case and 11.3 per cent in the other. On the addition of sulphate of ammonia to the above treatment the yield was increased over the untreated plat by 37.9 and 38.4 per cent, respectively. It is noted that these yields gave a gross profit on the fertilizer investment of 200.65 per cent.

Practical maize production, F. F. MATENAERS (*Der rationelle Maisbau. Berlin*, 1914, pp. XV+172, figs. 91).—This book describes methods employed in the production of the corn crop in the United States.

Single-stalk cotton culture, O. F. COOK (*U. S. Dept. Agr., Bur. Plant Indus. Doc. 1130* (1914), pp. 11, figs. 12).—This bulletin gives results of tests with Egyptian cotton at Bard, Cal., and Durango cotton at San Antonio, Tex., and Norfolk, Va., showing the advantage of close (6 to 12 in.) spacing of the plants and late thinning.

"The general result of the new system is to secure an earlier production of flowers and bolls. When the new and old systems are compared by applying them to alternate rows, there are striking differences of behavior. The advantage is greatest, of course, under extreme conditions where the season of production is shortened by drought, early frost, or the ravages of the boll weevil. The rate of flowering of rows of single-stalk plants, as shown by daily counts early in the season, has been found to average far above that of the intervening rows of larger, many-stalked plants, the differences sometimes amounting to from 40 to 60 per cent. At the end of the season, correspondingly increased yields are obtained from the single-stalk rows, in some cases over 50 per cent."

See also a previous note (E. S. R., 31, p. 433).

Cotton, its origin, uses, history, and importance, C. STEUCKART (*Die Baumwolle, ihre Herkunft, ihre Verwendung, ihre Geschichte, und Bedeutung. Leipzig*, 1914, pp. 59, figs. 17).—The four chapters treat of cotton and its industrial importance, the plant, the principal producing countries, and recent efforts in the industry.

Cost of producing cotton, N. C. MURRAY (*U. S. Dept. Agr., Farmers' Bul. 641* (1914), pp. 12-14).—This article summarizes the results of a study previously noted (E. S. R., 11, p. 41), and of an inquiry in 1910, based upon estimates of 862 crop reporters, which indicated that "the average total cost per acre was approximately \$20.35, and the production of lint 247 lbs., making an average cost of about 8.24 cts."

It is noted that the cost per acre to different growers varies widely. The average given includes some reporting the cost below \$12 an acre and others above \$35. "However, the cost per acre to each individual varies only moderately from year to year, there being a more or less gradual increase in the

past 20 years. On the other hand, the cost per pound to an individual grower varies widely from year to year, according as to whether his yield happens to turn out large or small." Tables show the estimated cost per acre and per pound of producing cotton in 1909 and 1910 by States of the United States.

The cotton crop surplus, F. ANDREWS (*U. S. Dept. Agr., Farmers' Bul. 641 (1914), pp. 9-12*).—This article contains statistics on the production of cotton in the United States for 1914, and the distribution as ginned and unginned cotton on November 1, the commercial movement, domestic consumption, and the condition of foreign markets.

It is noted that the quantity marketed this year up to November 1 was unusually low and that the surplus yet to find a market at the time of mid October was from 2,000,000 to 2,500,000 bales above the usual amount. Exports from August 1 to October 31 were said to be about 564,000 running bales, whereas in the same three-month period for the past four years the exports ranged from about 2,250,000 to 2,750,000 running bales.

In regard to domestic consumption it is noted that during 1881-1885 an average of about 1,900,000 bales were retained out of our crops for spinning in this country, and in addition to this domestic cotton there were imported for use of mills in this country about 7,000 bales a year. From the crop of 1913 over 5,500,000 bales were kept for mills in the country and nearly 266,000 were imported. The exports to the European countries, which are now at war, during the four years from July 1, 1910, to June 30, 1914, averaged nearly 8,000,000 bales per year, or 84 per cent of the total exports from the United States.

The cooperative marketing of cotton (U. S. Dept. Agr., Farmers' Bul. 641 (1914), pp. 14-16).—This article points out the advantages of cooperation and organization for the producer in disposing of his cotton crop, and suggests methods of operation. It is stated that in holding an unusual amount of cotton, as is the case this year, the growers can in any given locality make up even-running commercial lots ready for direct shipment to the mills or for export, or for sale direct to buyers. It is also noted that "if the cotton of a group of farmers can be stored in a single warehouse, the problem of marketing will be greatly simplified, for the material will be already assembled for shipment when a sale is made."

Guinea corn, J. J. MILLER (*Jour. Jamaica Agr. Soc., 18 (1914), No. 2, pp. 73, 74*).—This notes the successful cultural trials of red and white varieties of guinea corn under conditions of drought.

Influence of potash on rape, T. W. LONSDALE (*Jour. Agr. [New Zeal.], 9 (1914), No. 4, pp. 250-252*).—This article reports an increased growth of rape to which sulphate of potash had been applied in addition to superphosphates. The increase is given in terms of gain in weight of lambs pastured on the two plats. On the plat without the potash the gain was 84 lbs. and with potash 147 lbs. in 1912-13, while in 1913-14 the gains were 356 lbs. and 482 lbs., respectively.

Report of progress in sugar beet trials, J. W. INCE (*North Dakota Sta. Circ. 2 (1914), pp. 20, fig. 1*).—This circular contains data showing results of sugar beet experiments conducted at the station and in cooperation with farmers over the State. Tabulated data from 176 samples show results of analyses, cultural treatment, varieties used, relation of sugar to date of harvest, and meteorological conditions for 1913.

The percentage of sugar in beets ranged in 1913 from 8.6 to 20.8. With some fluctuations there was shown to be a general increase of sugar ranging from 14.53 to 16.01 per cent in samples harvested at different dates from September 25 to December 2.

A summary of sugar beet experiments carried on at the station since 1891 shows the sugar content to have ranged from 9.81 to 16.3 per cent as averages for the different years.

Field manual for sugar-beet growers, R. L. ADAMS (*Chicago, 1913, pp. VI+134, figs. 6*).—This work records the results of practical experiments and comparative field observations in the production of sugar beets from many sources. The subjects treated include cultural work, growing beet seed, siloing beets, manuring, crop rotations, feeding by-products, and beet troubles. Statistics are also included.

[Manurial and variety experiments with seedling and other varieties of sugar canes], J. R. BOVELL and J. P. D'ALBUQUERQUE (*Rpt. Agr. Work Barbados, 1910-1912, pp. 4-111*).—Results of 19 years of experimental work are given. In the manurial tests chemical fertilizers were used in addition to barnyard manure, and taking "the experiments for the 19 years as a whole, the largest average yield (8,226 lbs. saccharose) and the best monetary result was obtained where only nitrogen and potash were applied. In this case the gain, after paying for the manure, was \$17.84."

Identification of the seeds of species of *Agropyron*, R. C. DAHLBERG (*U. S. Dept. Agr., Jour. Agr. Research, 3 (1914), No. 3, pp. 275-281, figs. 4*).—This article gives the results of a study to attempt to discover a diagnosis that would unfailingly identify the seeds of the species of *Agropyron*. Such a diagnosis, it is claimed, would be of value to the farmer, the seedsman, and the seed laboratory. Laboratory methods of identification are described that cover characters regarding shape of seed, rachilla, lemma, and palea of seeds secured from many sources within the United States.

A summary of the work states that "it is possible by careful examination to distinguish in commercial seed mixtures the seeds of the three species of *Agropyron*: *A. repens*, *A. smithii*, and *A. tenerum*. There is no one character which can unfailingly be relied upon for this diagnosis, but the combined characters of lemma, palea, and rachilla are necessary for safe determination. Probably the nearest approach to a single critical structure is found in the palea, which exhibits fairly definite characters in each of the species."

Identification of plants, F. FYLES (*Canada Expt. Farms Rpts. 1913, pp. 493-496, pl. 1*).—This describes *Amaranthus spinosus*, which has recently been identified in Canada, and recommends methods for exterminating it, and also *Acroptilon picris*, *Hieracium aurantiacum*, *H. floribundum*, *H. pratense*, *H. prealtum*, and *H. pilosella*. An account is given of goldenseal and its cultivation.

HORTICULTURE.

The encyclopedia of practical horticulture, edited by G. LOWTHER and W. WORTHINGTON (*North Yakima, Wash., 1914, vols. 1, pp. XV+664; 2, pp. 665-1336; 3, pp. 1337-2037+24, illus.*).—This three-volume work was prepared under the auspices of fruit growers in the Pacific Northwest. It comprises as a whole a reference system of American horticultural practices and investigations bearing on horticulture with special reference to fruits and vegetables. Some attention is given to floriculture and propagation of plants in general; peanut culture, nut culture, mushroom culture, and bee culture are also considered.

The arrangement of the work is alphabetical and all of the commercial fruits and vegetables are treated in detail with reference to the various processes involved in their propagation, successful culture, harvesting, and marketing. Practically all the practices involved, such as irrigation, drainage, cultivation, pruning, intercropping, fertilizing, spraying, harvesting, storing, marketing, etc.,

are given special treatment, as are also many related subjects including the more important plant diseases, orchard costs and management, transportation costs, varieties, hybridization, plant physiology, evaporation of fruits, canning, preserving, preparation of fruits and vegetables for the table, equipment of the farm home, etc. Descriptions of the various fruit districts of the United States and their peculiar adaptations are given, together with the latest statistics of the industry for each district and for the whole country. Soil and climatic conditions are treated, as well as frost data with approximate dates to provide for and means and cost of prevention. The number of subjects enumerated is over 4,500. The work is illustrated by several hundred illustrations. Bibliographies on all phases of horticulture have been included, and an alphabetical index has been prepared and appended to the last volume.

Although the encyclopedia was prepared in the Northwest and deals more at length with practices of that region, the editors have been assisted by well-known scientific and practical horticulturists throughout the United States and Canada with a view to making the work of general application.

Horticulture in New Zealand, W. H. TAYLOR (*Jour. Agr. [New Zeal.]*, 9 (1914), No. 6, pp. 457-461, fig. 1).—The present status of horticulture in New Zealand is briefly considered.

Studies on the rest period of woody plants, L. VON PORTHEIM and O. KÜHN (*Österr. Bot. Ztschr.*, 64 (1914), No. 9-10, pp. 410-420, figs. 4).—The authors conducted a series of experiments in which different methods of shortening the rest period of plants were tried in combination. The plant material consisted of branches about 16 in. long of such plants as weeping birch, European beech, white poplar, willow, Persian lilac, black alder, and European hornbeam.

Molisch's warm bath process (E. S. R., 20, p. 640) was tested in combination with 12-hour periods of freezing, both before the bath and after the bath. The results in general indicate that when the forcing is conducted early in the rest period, freezing before the bath is superior to the bath alone in shortening the rest period, but, as Molisch found for the effect of the warm bath itself, the additional effect of freezing diminishes as the winter rest period progresses. Freezing alone was less effective than the warm bath alone.

The wounding method employed by Weber (E. S. R., 25, p. 642) was also tested in combination with the warm bath. Piercing the base of the buds previous to the warm bath proved superior to either the warm bath alone or wounding alone in shortening the rest period. Wounding alone was less effective than the warm bath alone.

Removing the outer bud scales in the case of the Persian lilac and the European beech was quite effective in shortening the rest period and proved to be superior to merely piercing the base of the buds. The authors are of the opinion that the beneficial influence obtained by removing the bud scales is due to a readjustment of pressure conditions in the buds. With reference to the selection of material for forcing purposes it was found that long branches usually forced out earlier and quicker than short branches.

A bibliography of cited literature is included.

[**Horticultural work at the Canadian experiment stations and farms**], W. T. MACOUN, F. T. SHUTT, ET AL. (*Canada Expt. Farms Rpts. 1913*, pp. 259-265, 286-303, 304-310, 313-316, 317-335, 338-346, 348-360, 362-364, 365-369, 373-379, 381-390, 392-401, 401-410, pls. 7).—This is the customary progress report for the fiscal year ended March 31, 1913, on breeding, cultural, and variety experiments with fruits, vegetables, ornamental trees and shrubs, etc., being conducted at the Central Farm, Ottawa, and the various branch experiment stations and farms in Canada (E. S. R., 29, p. 235).

Of the seedling fruits received for examination at the Central Farm during 1912 two apples and a plum are here described, together with 13 seedling apples which fruited on the farm for the first time during the year. Of 1,148 apple seedlings originated since 1903, 81 have thus far been considered sufficiently promising to name. Descriptions are given of two crossbred varieties having McIntosh and Lawver parentage. A number of second generation apple crosses resulting from Saunders' work (E. S. R., 25, p. 643) fruited in 1912 and are described, together with several promising seedling plums and strawberries.

In continuation of previous reports (E. S. R., 24, p. 441) a record is given of the yields, sales, expenses, and profits from the closely planted Wealthy apple orchard. The orchard was planted in 1896 and occupies about $\frac{1}{2}$ acre. The number of trees had been reduced from 144 to 97 at the end of 1912. The total net profit per acre for 17 years has been \$1,508.24. The average net profit per acre per year from date of planting is estimated at \$88.72 and from date of fruiting at \$107.73. Notwithstanding these returns, however, the practice of planting as close as 10 by 10 ft. is not recommended, since the trees must be removed from time to time to prevent crowding. Spraying was also difficult. When close planting is practiced with such varieties as Wealthy and Wagener it is advised that they stand at least 12 ft. part each way.

A variety list of the best vegetables based on the farm tests is given, together with a record of the six most productive varieties of tomatoes in the greenhouse test. The three best varieties of tomatoes for the two years of the test are Industry, Sutton Satisfaction, and Bonny Best. References are given to the literature of the horticultural division dealing with ornamental trees, shrubs, and flowers, together with notes on the behavior of various kinds of everlasting flowers tested in 1912.

Considerable data are presented relative to tests of different varieties of fruits, vegetables, and ornamentals at the branch stations and farms. A cost record for 1911-12 is given for the new commercial orchard at the Nappan Station, Nova Scotia (E. S. R., 29, p. 235). Data are also given on thinning experiments with apples conducted under the direction of the Kentville Station, Nova Scotia. The results of these experiments indicate in general that where trees are inclined to be vigorous and bear heavy crops a decided improvement in size of fruit accompanies thinning. Certain trees do not appear to respond as favorably to thinning as others. With the prices realized during the year as a basis it is estimated that an increased net return of \$68.66 per acre was secured by thinning Gravenstein apples. Lists are given of the best varieties of fruits, vegetables, useful and ornamental trees and shrubs, herbaceous perennials, climbers, and annuals for the Prairie Provinces.

Analyses of various insecticides and fungicides are included.

[Report on] garden vegetables, B. AUNE (*U. S. Dept. Agr., Bur. Plant Indus., Work Belle Fourche Expt. Farm, 1913, pp. 17, 18, fig. 1*).—A number of different varieties of garden vegetables were grown under irrigation at the Belle Fourche Experiment Farm, S. Dak., during 1912 and 1913. A list is here given of those varieties which have proved satisfactory.

Relative production of apple varieties, F. ANDREWS (*U. S. Dept. Agr., Farmers' Bul. 641 (1914), pp. 16-19*).—The author here presents data showing the relative production of the principal varieties of apples in the United States as a whole and in each of the important apple-producing States. The production is expressed as percentages of a normal crop of all apples. A table is also given showing the estimated approximate average annual production of leading varieties of apples by the principal States covering the period 1909 to 1913. The data are based upon replies received by the Bureau of Crop Estimates from 2,622 correspondents.

The five principal apples in the United States apparently are the Baldwin, with a relative production of 13.4 per cent of a normal apple crop; Ben Davis, 13.3 per cent; Northern Spy, 6.1 per cent; Winesap, 5.1 per cent; and Rhode Island Greening, 4.7 per cent.

Improvement of citrus fruits by bud selection, A. D. SHAMEL (*Cal. Cult.*, 43 (1914), Nos. 22, pp. 516-518; 24, pp. 580, 581).—A popular résumé of the author's investigations (*E. S. R.*, 28, p. 541).

An inspection of the average performance records for the seasons 1911 to 1914, inclusive, from the ten best producing and ten lowest producing standard Washington navel trees, located in one of the best navel orange groves in California, shows that the best trees have produced an average of 25.2 per cent more of the most valuable sizes than the poorest trees of the standard type. The best trees produced at the rate of \$546.21 and the poorest at the rate of \$128.44 per acre. Some success has been attained in replacing the poor individuals with a hereditary tendency to produce few and poor fruits with tops that produced the larger yield of better commercial grades and sizes of fruits.

Improvement of fruits by bud selection, L. B. SCOTT (*Cal. Cult.*, 44 (1915), Nos. 2, pp. 35-37; 3, pp. 68-71, fig. 1).—A popular account of the above noted work of Shamel's in the improvement of citrus fruits, including also a brief résumé of similar work being conducted by the same investigator with deciduous fruits.

Cold storage for tropical fruits, E. V. WILCOX and C. J. HUNN (*Hawaii Sta. Press Bul.* 47 (1914), pp. 12).—In the experiments here reported a study was made of the effect of cold storage on star apple (*Chrysophyllum cainito*), avocado, fig, papaya, water lemon (*Passiflora laurifolia*), strawberry guava, pineapple, and mango. Determinations were also made relative to the degree of refrigeration and length of time required to kill the Mediterranean fruit fly in various tropical fruits (see p. 451). Commercial refrigerator rooms maintained at average temperatures of 32, 36, and 45° F. were used. In the 32° room the temperature ranged from 30 to 33°; in the 36° room from 33 to 38°; and in the 45° room from 40 to 47°.

From these tests the conclusion is drawn that star apples intended for cold storage should be picked in a half ripe condition, cured in a well-ventilated room for about two days, and then held at 32° for not longer than three weeks. A discoloration and fermentation of the pulp begins sooner in fruit infested with fruit fly than in uninfested fruit.

Figs, even when picked in a ripe condition, seem to be adapted to cold storage at 32° for about one month. The flavor is unimpaired and the pulp is firmer and more attractive in appearance than in freshly picked fruit.

Papayas proved not well adapted to cold storage on account of the rapid development of molds in the dry papaine or juice of the papaya which exudes from the minute skin punctures that are generally present. When nearly ripe fruits were carefully washed in a 3 per cent solution of formalin and then thoroughly dried and placed in paper bags before going to cold storage they kept well for from 40 to 45 days, both at 32 and 36°.

Water lemons taken from a regular shipment of fruit to the territorial market kept in perfect condition at both 32 and 36° for a period of three months and held their flavor and physical appearance for four days after removal from refrigeration. Strawberry guavas were not well adapted to cold storage. Mildew developed abundantly on the rind and only a few of the fruits kept their normal flavor and appearance more than two weeks.

The appearance of mangoes stored when green at 32° remained normal in every way for the first month. Subsequent changes consisted in a shriveling of the skin which injured the appearance of the fruit. The pulp, however, re-

mained in good state of preservation for a storage period of two months, possessing a normal flavor. The flavor of the fruit was slightly flat when subsequently exposed to ordinary temperature for a period of two days. This was more noticeable with fruit stored at 36°. Perfectly ripe mangoes preserved the normal texture and flavor for a storage period of 35 days, after which the flavor deteriorated slightly.

Experiments with pineapples indicate that half-ripe and ripe pineapples may be stored for six weeks at a temperature of 32° without harm to the color or flavor of the pulp of the fruit. The only change is a slight deadening in the color of the rind. The avocado seems to be well adapted to cold storage at a temperature ranging from 32 to 36° for a period of at least two months.

Seed from several varieties of star apples held at 45° for various periods up to 25 days germinated promptly to the extent of 90 per cent, but seed from fruit held for more than 30 days in cold storage failed to germinate at all. Similarly with the seed of avocados, no germination took place from fruit held longer than 20 days at a temperature of 32°.

Further researches on some statistics of *Coffea*, P. C. VAN DER WOLK (*Ztschr. Induktive Abstam. u. Vererbungslehre*, 13 (1914), No. 1-2, pp. 176-184).—In continuation of previous studies (E. S. R., 31, p. 142) the author here presents some correlation tables referring to the relation between the number of "bloomheads" per leaf axil and the number of blooms per "head" in *Coffea quillou*. The author is of the opinion that the correlation coefficient is of no value to the physiologist.

In interpreting the correlations existing in the present tables a series of correlation diagonals is used.

Chinese trees and shrubs, W. J. BEAN (*Jour. Roy. Hort. Soc. [London]*, 40 (1914), No. 2, pp. 215-225, pls. 8).—This comprises notes on a number of promising Chinese ornamental trees and shrubs which have been introduced to cultivation as a result of E. H. Wilson's explorations.

History of the garden pink, E. M. KRONFELD (*Geschichte der Gartennelke. Vienna, 1913*, pp. IV+212, pls. 2, figs. 53).—This comprises a historical account of the garden pink, including the development of present day forms in France, Germany, England, and America.

FORESTRY.

Sixth annual report on forestry operations, E. SECREST (*Ohio Sta. Bul.* 276 (1914), pp. 317-330).—In continuation of previous reports (E. S. R., 29, p. 746) a general statement is given of progress made in the operation of forest nurseries, free distribution of stock, forestry experiments, farm woodlot problems, woodlot pasturage investigations, cooperative work with institutions and municipalities, assistance rendered in forest planting operations and educational work, drainage basin and commercial tree studies, and wood utilization. Suggestions are also given relative to needed legislation for the advancement of forestry in Ohio.

[Report on] tree planting, B. AUNE (*U. S. Dept. Agr., Bur. Plant Indus., Work Belle Fourche Expt. Farm 1913*, pp. 15, 16).—Notes are given on the condition and behavior of trees for shade, ornamental, and windbreak purposes that have been tested on the Belle Fourche Experiment Farm, S. Dak., since 1909.

In the test being conducted on dry land the only varieties that came through the severe winter of 1912-13 without any winterkilling were the green ash, Siberian pea, honey locust, and red cedar. Of these species the green ash and Siberian pea are the most hardy and desirable. The work with trees under irrigation has not progressed far enough to warrant any specific recommendation.

Report on forestry, WEHLBURG (*Jaarb. Dept. Landb. Nijv. en Handel Nederland. Indië, 1913, pp. 293-306*).—A progress report on forest administration in the Dutch East Indies, including information relative to alterations of forest areas, cultural operations, forest protection, exploitation, yields in major and minor forest products, revenues, expenditures, etc.

DISEASES OF PLANTS.

Report of the division of botany, H. T. GÜSSOW and J. W. EASTHAM (*Canada Expt. Farms Rpts. 1913, pp. 480-492*).—An account is given of some of the investigations which have been pursued during the year of the report, the work covering a study of the storage rots of potatoes, experiments with *Rhizoctonia* disease of potatoes, potato scab experiments, ergot, and storage spot of the apple.

Under the heading of storage rots the author describes all the troubles due to various organisms, and calls attention to the advisability of proper storage and the removal and destruction of diseased tubers whenever found.

In the experiment for the control of the *Rhizoctonia* disease, tubers were planted in a tract of land that had previously been badly infected with the fungus. One-half of the area was limed and the other half left untreated. The seed tubers were given various treatments, such as soaking in corrosive sublimate solution, dipping in glycerin and rolling in sulphur, and soaking in lime-sulphur solution. Examination of the crop showed no constant differences so far as the treatment was concerned, but the variety Carman No. 1 was almost entirely free from *Rhizoctonia* on the tubers.

The experiments with potato scab control included treatments with chlorid of lime, corrosive sublimate, lime-sulphur solution, sulphur, and sawdust. Sawdust has been claimed to be valuable for the control of this trouble, but proved to be of no benefit. The lime sulphur reduced scab more than any of the other treatments, although more than one-third of the tubers showed the presence of some scab.

The storage spot of apple was first noticed on Gravenstein apples in which spots varying from 0.3 mm. to 5 mm. in diameter were observed. These were depressed, brown in color, with dark centers, and in many cases appeared to be about a lenticel. The spots were usually less abundant on the side of the apple exposed to the sun. Cultures were made of diseased tissue and attempts made to determine the cause, but without evident success. The authors state that while the cause has not yet been demonstrated, it seems to be of a nonparasitic and external nature and to have much in common with the so-called Jonathan spot, which is suspected to be due to use of arsenate of lead as an insecticide.

Report from the branch laboratory of the division of botany, W. A. McCUBBIN (*Canada Expt. Farms Rpts. 1913, pp. 497, 498*).—An account is given of the investigations being conducted at the branch laboratory at St. Catharines, Ontario, the work reported being mostly that of a study of peach cankers, currant diseases, yellows, little peach, raspberry cane blight, etc.

The author reports the occurrence of *Pyropolyporus ribis* in large numbers on currants, and although a number of fungicides were tested none of them seemed to have proved effective in destroying the fungus.

The raspberry cane blight, which was rather prevalent and destructive in some parts of the district, was studied and experiments begun on the control of the disease by spraying.

[Plant diseases in Mauritius], F. A. STOCKDALE (*In Summary of Investigations of Fungus Diseases and Insect Pests Made During the Six Months Ended*

June 30. *Mauritius: Dept. Agr., 1914, pp. 1-3*.—This is a summary of investigations of fungus diseases made during the first half of 1914.

A root disease of sugar cane was connected with *Marasmius*, resembling somewhat *M. sacchari*, but more the Hawaiian than the Javan or West Indian form. Damage is caused by this fungus even in favorable seasons, several varieties being attacked. The fungus may be starved out by elimination of grasses or controlled by the use of quicklime, 3 to 5 tons per acre, or loss may be prevented by the use of resistant varieties.

Red rot (*Colletotrichum falcatum*) is reported from several localities. Selection of sound and resistant stock and removal of diseased canes at once and of all canes at cropping time are recommended. A rind disease seems to be associated with *Melanconium sacchari*, for which sanitation is prescribed.

A gumming disease of sugar cane is reported, possibly due to a bacterium, and a bacterial disease sometimes follows red rot. Some leaf diseases under investigation do not appear to occasion much damage.

The cause of a fungus root disease of citrus plants has not been definitely ascertained, but quicklime, forked into the soil, and isolation trenches are indicated as beneficial.

Collar rot of potatoes, causing somewhat less damage than in 1913, was lessened by the application of a small quantity of quicklime.

Recent advances in our knowledge of the genus *Phytophthora*, G. H. PETHYBRIDGE (*Jour. Econ. Biol.*, 9 (1914), No. 2, pp. 53-63, pls. 2).—The results of a study of different species of the genus *Phytophthora* are given, and the author concludes that the genus, as usually understood, contains species which differ from one another fundamentally in the way in which the development of the sexual organs takes place. This difference, it is said, practically compels the splitting of the old genus *Phytophthora* into two, of which *P. erythroseptica*, *P. infestans*, *P. phaseoli*, *P. colocasia*, *P. parasitica*, and *P. arecae* are to be retained in the old genus, while the other species are to be transferred to the genus *Nozemia*.

Studies in North American *Peronosporales*, G. W. WILSON (*Mycologia*, 6 (1914), No. 4, pp. 192-210, pls. 2).—These brief notes on miscellaneous species include, among accounts of introduced or native forms, a discussion of the new genus *Bremiella* (represented in America only by *B. megasperma* n. sp.), the newly named form *Pseudoperonospora humuli*, and the following new species, *Peronospora lepidii*, *P. chamæsyctis*, and *P. minima*, with suggestions as to renaming some other forms discussed.

Conidium production in *Penicillium*, C. THOM (*Mycologia*, 6 (1914), No. 4, pp. 211-215, fig. 1).—The author describes and discusses some characters, modifications, and changes as noted in the conidiophores, conidia, etc., of the forms grouped under the name *Penicillium*.

A cancer of plants, R. RÉGMEY (*Compt. Rend. Acad. Sci. [Paris]*, 159 (1914), No. 22, pp. 747-749).—A description is given of a canker-like growth discovered on a young oak tree in the park of Versailles in which proliferous tumors were present. From these tumors the author isolated an organism, *Microspira carcinopæus*. Inoculation experiments have been unsatisfactory on oaks, but positive results have been obtained where inoculations were made on the common garden nasturtium and on ivies.

The disease is considered distinct from the crown gall of this country, and the organism is said to be very different from the one causing the latter disease.

Oat sickness in sandy and clayey soils, J. HUDIG (*Verslag. Landbouwk. Onderzoek. Rijkslandbouwproefstat. [Netherlands]*, No. 15 (1914), pp. 74-86).—Investigations previously reported (*E. S. R.*, 24, p. 523; 25, p. 724; 28, p. 520)

have been followed by a study of the behavior of oats on sandy or clayey soils upon the addition of various fertilizing materials.

Light clayey soils show a tendency to produce oat sickness, this increasing with the proportion of sand present. Treatment with alkali is injurious, but that with acid fertilizers is helpful. In the case of sandy soils, superphosphate and ammonium sulphate are found helpful.

Clover and lucern leaf spot, IVY MASSEE (*Jour. Econ. Biol.*, 9 (1914), No. 2, pp. 65-67, figs. 4).—A description is given of the leaf spot of clover and alfalfa due to *Pseudopeziza trifolii*.

In addition to species of *Trifolium*, the fungus occurs on a number of species of *Medicago* and also on *Trigonella fœnumgræcum*. As preventive measures, the destruction of wild host species in the vicinity of fields is advised, and, as the fungus is borne on the seed, it is suggested that the seed be treated with hydrogen peroxid.

A fungus disease of berseem, J. CHERSTIAN and R. MAIRE (*Bul. Agr. Algérie, Tunisie, Maroc*, 20 (1914), No. 10, pp. 316-324, figs. 6).—A description is given of *Rhabdospora alexandrina* n. sp., a fungus which has been found in Algeria to be quite destructive of berseem or Egyptian clover (*Trifolium alexandrinum*).

The late blight of potato, S. K. BASU (*Agr. Jour. Bihar and Orissa [India]*, 1 (1913), No. 2, pp. 142-149, fig. 1).—Giving an account of the sudden appearance, quick spread, and destructive effects of *Phytophthora infestans*, which was observed at and near the Sabour Experimental Station, India, during the very foggy, misty weather which prevailed about Christmas, 1912, injuring potato crops in some instances from 50 to 90 per cent, the author cites evidence of its having been brought down in mycelial form with seed potatoes shipped from the hills on account of seed scarcity in the plains. No other solanaceous plants were attacked by this fungus, but no potato variety in India has proved immune to late blight, although young plants are more resistant thereto.

Late planting is suggested, and spraying with Bordeaux mixture has apparently helped in some cases.

A blight-proof potato (*Queensland Agr. Jour.*, n. ser., 2 (1914), No. 2, pp. 103-106).—An account is given of a productive variety of potatoes, New Era, which after about six years' trial is claimed to be totally resistant to blight and also unusually resistant to frost.

A blight and frost resisting variety of potato (*Gard. Chron.*, 3. ser., 56 (1914), Nos. 1450, p. 250; 1452, p. 280).—These two notices refer to the variety of blight proof potato above noted. The New Era potatoes, when tested in the British Isles, are said to have shown susceptibility to both late blight and frost injury in that region.

Potato canker, O. APPEL (*Deut. Landw. Presse*, 41 (1914), No. 67, pp. 794, 795, pl. 1).—A description is given of black scab or canker of potato (due to *Chrysophlyctis endobiotica*) which is said to have appeared in Germany in 1908, but which is believed to be confined to a few small areas. No remedial measures are offered except complete destruction by fire of all plants on affected soil and the employment of such land for other crops during at least five years.

Potato scab, G. P. DARNELL-SMITH (*Agr. Gaz. N. S. Wales*, 25 (1914), No. 10, pp. 869-872).—A number of causes of scab in potatoes are described, among them physical agencies, attacks of nematodes, and various fungi. According to the author the fungi causing scab in Australia are *Oospora scabies*, *Rhizoctonia solani*, and *Spondylocidium atrovirens*. Other fungi, such as *Spongospora subterranea* and *Synchytrium endobioticum*, while producing scab of potato tubers, have not yet been reported in that country.

Where the scab is due to the action of fungi the author recommends the formalin treatment of seed potatoes.

Wart disease of potatoes, T. H. MIDDLETON (*Bd. Agr. and Fisheries [London], Ann. Rpt. Hort. Branch, 1913-14, pp. 38-55*).—An account is given of investigations on control measures undertaken under the Wart Disease of Potatoes Orders of 1913 and 1914. It has been demonstrated for at least five years that certain varieties of potatoes, if true to type, are wholly resistant to this disease, and that under ordinary conditions these varieties will yield a sound crop while susceptible varieties will give a number of warty potatoes.

Potato spraying, DUKE OF BEDFORD and S. U. PICKERING (*Woburn Expt. Fruit Farm Rpt., 14 (1914), pp. 1-32; abs. in Gard. Chron., 3. ser., 56 (1914), No. 1460, p. 401*).—A report is given of experiments on spraying potatoes, the initial object of which was to ascertain the proportion of Woburn Bordeaux paste which is equivalent in fungicidal action to ordinary Bordeaux mixture.

The paste is prepared by precipitating a solution of copper sulphate with clear limewater sufficient to render the mixture barely alkaline and then separating the precipitate. When used this is simply mixed with water and the preparation is complete. Some difficulty has been met with in preparing a commercial mixture of this sort, but the authors consider that this has been overcome.

As a result of the experiments it was found that on potatoes sprayed for the prevention of late blight 15 or 16 lbs. of the paste was as efficient as Bordeaux mixture made with 8 lbs. of copper sulphate and 8 lbs. of lime to 100 gal. of water. The Bordeaux mixture as prepared by the ordinary method would contain five or six times as much copper as the paste.

A trial was made of soda Bordeaux, but it was found not to compare favorably either with the paste or with ordinary Bordeaux mixture, even when the amount of copper in it was very large.

Control of potato diseases in Wisconsin, L. R. JONES (*Wisconsin Sta. Circ. 52 (1914), pp. 19, figs. 4*).—A popular description is given of a number of the nonparasitic and parasitic diseases of potatoes, with suggestions for their control.

Studies on the relation of certain species of Fusarium to the tomato blight of the Pacific Northwest, H. B. HUMPHREY (*Washington Sta. Bul. 115 (1914), pp. 22, pls. 5*).—The results are given of an extended study of the history, distribution, cause, and methods of control of the disease commonly known as yellow blight in the States of the Pacific Northwest.

This disease is generally characterized in its incipient stage by twisting of the leaf accompanied by a purpling of the leaf veins. Later the leaves are twisted and rolled inward, followed by a drooping, but not a wilting, of the leaflets and leaves. The fruits develop poorly and often seeds are not produced. With the appearance of the blight there is a marked cessation of growth, and all plants assume an erect habit excepting those cases in which the root systems have been invaded late in the season.

The studies show that the cause of the disease is in part at least two species of Fusarium, *F. orthoceras* and two varieties of *F. oxysporum*. Chlamydo-spores of the fungi are said to be produced abundantly in the soil, and it is possible that they may also be propagated by a perennial mycelium formed in the roots of blighted plants.

Among the factors which limit the disease are soil temperature and moisture, wind movement, air temperature, and light intensity. Crop rotation and planting in virgin soil are thought to be of doubtful preventive value, the greatest freedom from the disease being obtained where the practice of transplanting from hotbed to cold frames or field is abandoned.

Apple canker, S. P. WILTSHIRE (*Abs. in Gard. Chron.*, 3. ser., 56 (1914), No. 1460, p. 401).—The author reports that the wound parasite *Nectria ditissima* invariably induces infection if the wound through which it enters is deep enough to penetrate to or nearly to the wood; otherwise protective tissue is formed and the parasite is excluded from the living tissues. It is said that the disease is generally localized, though the capability of the fungus to spread from one part to another has not yet been determined. It is claimed that there is no danger of communicating the disease by grafting provided the graft is taken from a healthy shoot.

An algal disease of cacao, W. G. FREEMAN (*Bul. Dept. Agr. Trinidad and Tobago*, 13 (1914), No. 83, pp. 263, 264).—Notes are given on the occurrence of a disease of cacao due to *Cephaleuros virescens*. The disease is said to be manifested by a dying back of the shoots and is particularly characterized by the leaves turning brown, but not falling, so that trees badly attacked are covered by dead twigs and brown leaves.

In addition to occurring on the cacao this alga has been reported as doing considerable damage to mangoes and to other tropical trees, as well as on tea in India.

Operations against cacao canker, C. J. J. VAN HALL (*Meded. Proefstat. Midden-Java*, No. 14 (1914), pp. 10).—This is a report of observations on the spread and effects of cacao canker in the vicinity of Pekalongan from 1908 to 1914, also of attempts there during the last two years to control the disease, which is favored by wet weather, but appears to abate during the dry season. The organism not only attacks wounded areas but uninjured parts also.

The use of Bordeaux mixture, especially on two experimental areas as described, reduced considerably in one year's time the number of trees showing canker in the wet months of January and February.

Black spot of the mandarin (*Queensland Agr. Jour.*, n. ser., 2 (1914), No. 2, pp. 143, 144).—Advice pending results of test experiments in progress is given to orchardists. Trees are to be pruned radically on every appearance of disease, all of the prunings being destroyed by fire. Several spraying mixtures are recommended, with directions as to proportion, strength, and times of application. See also a previous note (E. S. R., 31, p. 843).

American gooseberry mildew, T. H. MIDDLETON (*Bd. Agr. and Fisheries [London], Ann. Rpt. Hort. Branch, 1913-14*, pp. 10-28).—A report is given of the investigations carried on concerning the American gooseberry mildew under the Destructive Insects and Pests Acts, in which the relation of weather conditions to the appearance and development of the mildew, occurrence of the disease on the fruit, state of the disease in various affected districts, and effect of spraying on the control of the disease are described.

In the spraying experiments different strengths of lime sulphur, potassium sulphid, and Bordeaux mixture were used, but inspectors who visited the premises at different times were convinced that the benefits resulting from spraying were not commensurate with the cost. No spray material has proved so successful in permanently reducing the disease as has the expedient of removing and destroying the infected shoots as soon as the bushes have stopped making growth.

The treatment of court-noué by tar, J. BERTRAND (*Bul. Agr. Algérie, Tunisie, Maroc*, 20 (1914), No. 1, pp. 15-20).—The author, citing experiments that have been carried on for several years, states that coal tar may be successfully used for the treatment of court-noué. The affected vines should be pruned and covered with tar very shortly after the pruning, the same day if possible. Care should be taken that the stock be well covered, but the tar must not come in contact with the buds, as it is said to destroy them.

Downy mildew and measures for combating it, V. MARTINAND (*Rev. Vit.*, 41 (1914), No. 1071, pp. 707-710).—A discussion is given of the rôle of rain, dew, and fog in the dissemination of the spores of the downy mildew of grapes.

The diseases of the sweet pea, J. J. TAUBENHAUS (*Delaware Sta. Bul.* 106 (1914), pp. 93, figs. 45).—This bulletin, which was also presented as a thesis to the Graduate School of the University of Pennsylvania, embodies the results of the author's studies on the diseases of sweet peas. Some of the conclusions have been previously noted (*E. S. R.*, 29, pp. 352, 650). In the bulletin the author considers the diseases under the heads of fungus, bacterial, and physiological diseases, discussing those which have attacked different parts of the plant.

Among his conclusions the author states that the disease known as streak in England is due to *Bacillus lathyri* and not *Thielavia basicola*, as has been claimed (*E. S. R.*, 26, p. 551).

In connection with these investigations the pathogenic nature of *Corticium vagum* has been established, and *Chaetomium spirochate* has been shown to produce a root rot of the sweet pea. A *Fusarium* disease is described, and the name *F. lathyri* n. sp. has been given the organism causing it.

Among the animal parasites of the sweet pea the nematode *Heterodera radicola* is described, and it is said that this parasite is associated with several fungus diseases. A collar rot as well as a stem disease of the sweet pea, due to *Sclerotinia libertiana*, are described for the first time.

A mildew of the sweet pea, which is very prevalent under greenhouse conditions, has been studied. This is due to a species of *Oidium*. The perfect stage has not yet been found.

The relation of *Glomerella rufomaculans*, the cause of the anthracnose of the sweet pea, to species of this fungus on other hosts is discussed at some length. The author has shown the pathogenicity and infectious nature of the mosaic disease, which is considered as probably due to bacteria or protozoa which present methods of investigation are not able to detect. A disease known as bud drop is described, which is said to be induced by a high nitrogen supply which is not properly balanced by phosphoric acid and potash.

Under methods of control attention is called to the fact that certain individuals are more immune to anthracnose than others, although no one variety seems particularly nonsusceptible.

Experiments are reported in which boiling seeds for one or two seconds, soaking them in sulphuric acid, or soaking in 5 per cent formaldehyde solution showed that all of these treatments would destroy the spores of parasitic fungi without injury to germination. Soaking seeds in sulphuric acid increased the percentage of germination.

Watering soils with chemical solutions is said not to increase the resistance of plants grown in that soil.

A method has been devised for determining the length of time which any fungicide can remain efficient in controlling plant diseases when sprayed on the plant to be treated. This consists essentially of spraying the fungicides on a large number of slides which are dried and divided into different lots and germination tested at definite intervals.

A bibliography of the subject is given.

The chestnut blight fungus and a related saprophyte, P. J. and H. W. ANDERSON (*Penn. Chestnut Tree Blight Com. Bul.* 4 (1913), pp. 26, figs. 6).—The substance of this bulletin has already been noted from another source (*E. S. R.*, 28, p. 551).

The destruction of insects and fungi, L. SEMICHON (*Rev. Vit.*, 42 (1914), No. 1076, pp. 113-120).—The author describes the use of hot water for the control of certain insects and fungus diseases.

Among the fungi which it is claimed may be controlled in this manner are various mildews and other fungi with the superficial mycelium. The young plants, or those vigorously growing in early spring, are said to be able to withstand water heated to 70° C. (158° F.), and older tissues, such as fruit trees, readily withstand a temperature of 75°.

In applying the hot water treatment the author recommends the addition of boiling water to water of a lower temperature so as to bring the amount required to a temperature of 71 or 72°. This is to be drenched over the plants and not sprayed in the form of a mist. Where it is desired to treat grades for downy mildew, it is recommended that a kilogram of neutral copper acetate be added to each hectoliter (1 lb. to 12 gal.) of water heated to 65°. This temperature of the water not only aids in rapid solution, but is said to increase the spreading of the fungicide.

A form of apparatus is described which is recommended to be used in connection with spraying with hot water.

ECONOMIC ZOOLOGY—ENTOMOLOGY.

Wild life conservation in theory and practice, W. T. HORNADAY (*New Haven, Conn., and London, 1914, pp. VI+240, pls. 19*).—This work consists of lectures delivered before the Forest School of Yale University in 1914. The subjects discussed are the extinction and preservation of valuable wild life, the economic value of our birds, the legitimate use of game birds and mammals, animal pests and their rational treatment, and the duty and power of the citizen in wild life protection.

A chapter on private game preserves as factors in conservation (pp. 195-222), and a bibliography of more recent works on wild birds with special reference to game preserves and the protection and propagation of game (pp. 223-229), by F. C. Walcott, are included.

Useful birds and their protection, E. H. FORBUSH (*Boston: Mass. Bd. Agr.*, 1913, 4. ed., pp. XX+451, pls. 61, figs. 171).—A revised and enlarged edition of the work, previously noted (E. S. R., 18, p. 1143).

Birds of New York, E. H. EATON (*N. Y. State Mus. Mem.* 12, pt. 2 (1914), pp. 719, pls. 64, figs. 65; *rev. in Science*, n. ser., 40 (1914), No. 1036, pp. 677, 678).—This second part of the work previously noted (E. S. R., 24, p. 53) comprises discussions of bird ecology (pp. 5-46), the economic value of birds (pp. 46-51), the status of our bird laws (pp. 51, 52), special measures for increasing bird life (pp. 52-58), bird refuges (pp. 58, 59), private preserves (pp. 59, 60), and a systematic account of land birds (pp. 61-543).

The chapter on bird ecology treats of the fundamental factors of environment, bird habitats, nesting sites of New York birds, bird communities, succession of bird life, birds of Potter swamp, birds of a typical deciduous forest, birds of the central lake ravines, the influence of culture operations, such as timber cutting, draining of swamps and marshes, pruning of shade and fruit trees, etc., food of birds, and injury done by birds in different ways by particular species.

The systematic part treats of the genera and species in the sequence of the A. O. U. Check List. Sixty-five half-tone illustrations, mostly of young birds or of nests and eggs, 64 colored plates by L. A. Fuertes, and an index to the two volumes are included.

The review is by J. A. Allen.

The frogs and toads [of Long Island], F. OVERTON (*Mus. Brooklyn Inst. Arts and Sci., Sci. Bul.*, 2 (1914), No. 3, pp. 21-40, pls. 12, fig. 1).—In this paper two species of toads and eight of frogs occurring on Long Island are briefly dealt with. Photographic illustrations are included.

The scope and aims of applied entomology, A. D. IMMS (*Parasitology*, 7 (1914), No. 1, pp. 69-87).—The author discusses this subject under the headings of medical entomology, agricultural entomology, economic entomology, and the place of physiological research in applied entomology.

A list of references to the literature cited is appended.

Experiments on inheritance in parthenogenesis, W. E. AGAR (*Phil. Trans. Roy. Soc. London, Ser. B*, 205 (1914), No. 323, pp. 421-489).—In the investigations here reported the author made use of four insects which commonly reproduce parthenogenetically, namely, *Simocephalus caspinosus*, *S. vetulus*, *Daphnia obtusa*, and *Macrosiphum antherinii*.

Report from the division of entomology for the fiscal year ending March 31, 1913, C. G. HEWITT (*Canada Expt. Farms Rpts. 1913*, pp. 499-518, pl. 1).—This report deals briefly with the administration of the Destructive Insect and Pest Act under the headings of inspection and fumigation of imported nursery stock and field work against the brown-tail moth and parasite work; with insects affecting field crops, fruit crops, forest and shade trees, domestic animals, and man, and garden and greenhouse; and with apiculture.

Among the more important pests of the year mentioned are cutworms (*Prosa-grotis delorata*, *Euxoa ochrogaster*, et al.), depredations by which were extensive and unusually severe in southern Alberta; chinch bugs, about 25 per cent of which were destroyed in the fall by *Sporotrichum globuliferum*; eelworms, which injured wheat plants in Alberta by attacking the stems and may prove to be the European pest *Tylenchus devastatrix*, this being the first record of injury to staple crops by the pest in North America; the seed corn maggot (*Pegomya fusciceps*) which was unusually injurious in Ontario; *Olethreutes frigidana*, not previously regarded as of economic importance, which was found to injure apple buds in Nova Scotia; the apple maggot and the San José scale, both of which appeared in Nova Scotia for the first time; the strawberry root weevil (*Otiorhynchus ovatus*) (E. S. R., 30 p. 58), one of the most injurious small fruit pests in British Columbia; the western tent caterpillar (*Malacosoma erosa*), which defoliated apples in the Fraser Valley; *M. americana* and *M. disstria*, which were abundant on forest and shade trees in Ontario, Quebec, and New Brunswick; bark beetles, several species of which were the source of considerable injury to timber; the spruce budworm (*Tortrix fumiferana*), which is gradually spreading eastward; scale insects of several species which injured forest and shade trees; the larch case bearer (*Coleophora laricella*), which was abundant on larches at Ottawa; the Rocky Mountain spotted fever tick (*Dermacentor venustus*), chiefly distributed in Canada in the Kootenai region; the European ox warble or botfly (*Hypoderma bovis*) which has been found to occur in British Columbia, and at Agassiz to be the common species (E. S. R., 29, p. 357); etc.

Annual report for 1913 of the zoologist, C. WARBURTON (*Jour. Roy. Agr. Soc. England*, 74 (1913), pp. 379-389, figs. 3).—Among the insects discussed are the spruce aphid (*Aphis abietina*), pea thrips, and raspberry beetle (*Byturus tomentosus*).

[Report of] division of entomology, F. P. JEPSON (*Fiji Dept. Agr. Ann. Rpt. 1913*, pp. 12, 13).—This is a brief report of the work of the year in Fiji.

Report of division of entomology for 1913, D. d'EMMERZ DE CHARMOY (*Ann. Rpt. Dept. Agr. Mauritius, 1913*, pp. 10-12).—This report deals briefly

with the occurrence of the more important insects, especially those attacking sugar cane. *Tiphia parallela*, a parasite of *Phytalus smithi*, was introduced from Barbados during the year.

[Insect pests in Mauritius], D. d'EMMEREZ DE CHARMOY (In *Summary of Investigations of Fungus Diseases and Insect Pests Made During the Six Months Ended June 30. Mauritius: Dept. Agr., 1914, pp. 4, 5*).—A brief report on the more important insects in Mauritius and means for their control.

Crop pest handbook for Behar and Orissa (including also western Bengal) (Calcutta: Dept. Agr., Behar and Orissa, 1913, pp. XXIII+[170]+21, pls. 52, figs. 4).—This work deals with the important insect enemies and diseases of plants in this part of the Bengal Presidency under the headings of the crops attacked. Under each insect the nature of damage, locality and time of appearance, food plants, description and life history, and remedial measures are briefly dealt with. A colored plate illustrating the life stages and nature of the injury accompanies the accounts of most of the pests. Remedial and control measures in general are taken up in several appendixes.

Insects found on nursery stock imported into New Jersey during 1913, H. B. WEISS (*Ent. News*, 25 (1914), No. 9, pp. 392-395, figs. 2).—Lists are presented of insects intercepted during (1) the spring and (2) the fall.

Some consideration on protection of orchards from insects, P. J. PARROTT (*West. N. Y. Hort. Soc. Proc.*, 59 (1914), pp. 110-118, figs. 5).—The author here discusses (1) the susceptibility of eggs of insects to spraying mixtures, (2) the comparative merits of various sulphur mixtures, (3) some insects that disfigure fruits, (4) the injurious work of tree hoppers in apple orchards, (5) the parasites of the San José scale, and (6) spraying to combat plant lice of apple trees.

Insects injurious to the household and annoying to man, G. W. HERRICK (*New York*, 1914, pp. XVII+470, pls. 8, figs. 152).—A concise description of the appearance, habits, and injuries of household pests, written particularly for the housekeeper and for those who desire to obtain information regarding household pests and practical methods of controlling them.

New species of Diaspinæ living on the olive, G. LEONARDI (*Bol. Lab. Zool. Gen. e Agr. R. Scuola Sup. Agr. Portici*, 7 (1913), pp. 66-71, figs. 5).—*Aonidia olæ* and *Lepidosaphes olivina* infesting leaves of the olive in Eritrea are described as new.

The larger corn stalk borer, G. G. AINSLIE (*U. S. Dept. Agr., Farmers' Bul.* 634 (1914), pp. 8, figs. 4).—This bulletin dealing with *Diatraea saccharalis*, better known as the sugar cane borer, is a reprint of Bureau of Entomology Circular 116, previously noted (*E. S. R.*, 23, p. 54).

On the conversion of cotton sticks into charcoal for the destruction of the pink bollworm, A. T. MCKILLOP (*Agr. Jour. Egypt*, 3 (1914), No. 2, pp. 127-129).—It is stated that during the year 1913 the pink bollworm (*Gelechia gossypiella*) infestation was so high that it was impossible to find cotton seed which did not contain from 3 to 20 per cent of living worms, and that the worms at the time of writing were present in millions in the dry cotton bolls on stalks stored on the tops of the fellahin houses. It is reported on the authority of A. Andres that the larvæ form cocoons in the interior of the seeds and remain in a dormant state for as long as seven months without requiring any nutriment. Since the law regarding the bollworm is in the course of reconstruction, it is thought that it may be advisable to introduce a proviso that all cotton stalks be destroyed by fire or carbonized before a fixed date.

The series of experiments here reported upon show that by the baladi method, which is described, the bollworm may be destroyed and from 9 to 55 per cent

of the original weight of the stalks be retained as charcoal. A retort is said to have been patented which will convert small lots of cotton stalks into charcoal in a few hours and is capable of making from one-fourth to one-half a ton per day. Attention is called to the fact that the calorific value of the charcoal is 7,420, as compared with that of 2,744 for cotton wood.

A new *Gracilaria* on azalea, A. BUSCK (*Insecutor Inscitiæ Menstruus*, 2 (1914), No. 1, pp. 1, 2).—*Gracilaria azaleæ*, a lepidopteran reared from leaf-mining larvæ on azalea at Yonkers, N. Y., also at New Brunswick, N. J., from azalea imported from Germany, is described as new to science.

The chestnut bast miner, A. BUSCK (*Insecutor Inscitiæ Menstruus*, 2 (1914), No. 1, pp. 3, 4, fig. 1).—*Ectoedemia phleophaga*, a tineid which lives in the lower layer of the bark of the chestnut just above and encroaching upon the cambium, is described as new. Both larvæ and adults of this species have been reared at Falls Church, Va.

Observations of the enemies of rice (*Oryza sativa*), particularly *Chironomus cavazzai*, F. CAVAZZA (*Bol. Lab. Zool. Gen. e Agr. R. Scuola Sup. Agr. Portici*, 8 (1914), pp. 228-239, pl. 1).—This article deals largely with the biology of *C. cavazzai*, a chironomid that is a source of injury to rice in the Italian Provinces of Bologna and Ferrara. This dipteran was first described by Kieffer in 1913.^a

A contribution to the knowledge of bloodsucking *Ceratopogoninæ* of Brazil, A. LUTZ (*Mem. Inst. Oswaldo Cruz*, 5 (1913), No. 1, pp. 45-73, pls. 3).—Twelve species are described as new in this continuation of the work previously noted (E. S. R., 29, p. 54).

The posterior stigmata of dipterous larvæ as a diagnostic character, with especial reference to the larvæ incriminated in cases of myiasis, M. E. MACGREGOR (*Parasitology*, 7 (1914), No. 2, pp. 176-188, pls. 3, figs. 3).—This study is illustrated by photomicrographs of the various forms of posterior stigmata occurring in dipterous larvæ concerned in myiasis.

Myiasis of the urinary passages, E. F. KING (*Jour. Amer. Med. Assoc.*, 63 (1914), No. 26, pp. 2285, 2286).—*Fannia scalaris* was the species concerned in the case here reported.

Effect of cold storage upon Mediterranean fruit fly, E. V. WILCOX and C. J. HUNN (*Hawaii Sta. Press Bul.* 47 (1914), pp. 10-12).—It is pointed out that in fruit fly experiments in Australia (E. S. R., 19, p. 145) in 1907 eggs exposed to temperatures of from 33 to 35° F. lived for 15 days. In experiments conducted by the authors no pupæ developed and no adult flies were obtained from infested star apples (*Chrysophyllum cainito*) kept in cold storage for 10 days at a temperature of 32°; and no adult flies were obtained from infested figs kept at the same temperature for the same length of time.

Experiments were then conducted with infested mangoes and citrus placed in two cold-storage rooms, one kept at a temperature of 32°, the other at 36°. Baskets of infested fruit were removed at the end of 2½ days and every day thereafter until a period of 15½ days had elapsed. Thirty flies emerged from the fruit kept at 36° and 25 from that kept at 32°, but no adult flies from fruit which had been kept at a temperature of 32° longer than 2½ days, and no flies from fruit which had been held at a temperature of 36° longer than 4½ days.

A series of experiments was conducted in which 6 full grown larvæ were placed on moist sand in each of a number of jars and kept in rooms exposed to a temperature of 32 and 36° for 4, 7, 11, and 14 days, respectively. Two larvæ in the jar kept at 32° for four days pupated after removal but no further development took place. All the larvæ were dead when examined 22 days

^a Bol. Lab. Zool. Gen. e Agr. R. Scuola Sup. Agr. Portici, 7 (1913), p. 210.

after removal from cold storage. In the jar kept at 36° for four days two larvæ were alive and one had pupated at the end of that time, a single adult fly emerging from one of the pupæ at the end of 15 days. From the jar removed after seven days two larvæ were dead and four alive, while all the larvæ were dead in the jars removed after 11 and 14 days.

The authors conclude that while fruit fly larvæ and eggs failed to live through an exposure in cold storage even at 36° for longer than 4½ days, it is not safe, however, to assume 4½ days as an outside limit. They consider it safe to assert that infested fruit maintained for two weeks at a temperature of 32° could not possibly contain the living fruit fly in any stage. Avocados are about the only commercial Hawaiian fruits subject to Mediterranean fruit fly infestation for which there is a demand on the mainland, but they may be held for at least two months in cold storage.

The assertion that avocados could be pickled in salt water in such a manner as to destroy the fruit fly and make them safe for shipment to the mainland led the authors to make a few tests. Ripe and green avocados were placed in salt water of strengths varying from ¼ to 1 lb. of salt per gallon, and left to stand at ordinary room temperature. At the end of one month the avocados were found to be perfectly preserved, the color, texture, and appearance being the same as when placed in the salt water, and no fermentation or decay had taken place. After having been placed in fresh water to extract the salt the fruit was tested, and the flavor found to be flat and disagreeable. Thus it appears doubtful whether avocados can be preserved in salt water without losing much of the delicacy of their flavor.

The marguerite fly or chrysanthemum leaf miner (*Phytomyza chrysanthemi*), M. T. SMULYAN (*Massachusetts Sta. Bul.* 157 (1914), pp. 21-52, pls. 3).—This agromyzid fly has been the source of considerable injury to plants grown under glass in Massachusetts for ornamental purposes, especially to marguerites or daisies, chrysanthemums, and other Compositæ. In many instances the commercial growing of marguerites and some other Compositæ is said to have been given up on account of the injury caused by this pest.

The marguerite fly, which was first detected in this county in October, 1886, in a greenhouse near Glen Cove, N. Y., is said to be generally distributed throughout the eastern part of Massachusetts, and to be known to occur in the States of New Hampshire, Connecticut, New York, Pennsylvania, Illinois, Wisconsin, and Montana, and is doubtless present in many others. While marguerites and feverfewes seem to be its favorite host plants, it is also known to attack eupatoriums, gazanias, helianthus, cinerarias, tansies, chrysanthemums, golden-rod, ragweed, dandelions, beggar-ticks, wild carrot, the common white or oxeye daisy, and everlasting or ladies' tobacco.

The injury is caused by the larvæ mining within the leaves and living upon the mesophyl or fleshy portion. The mining is seen on the surfaces of the leaves as irregular whitish lines or patches, often extending to take in the whole surface, and causes the death of part or the whole leaf. The activity of the larva results in a serious interference with normal growth, in checking flowering or in the reduction of the number of flowers normally produced, and in a reduction in the size of the flowers. Small plants may be killed in a comparatively short time if exposed continually to attack.

From 125 to 150 eggs may be deposited by a single female. The eggs are laid singly in horizontal incisions made by the ovipositor between the parenchyma and epidermis principally on the lower surface. The eggs hatch in slightly over 4.5 to somewhat over 5.5 days. Pupation takes place within the larval mine, the pupal stage lasting as a rule from 13 to 15 days. The mean or average length of a complete life cycle or generation is about 33.5 days.

"The insect may be controlled by spraying with the nicotin solutions black-leaf 40, Nico-Fume liquid, and Nicoticide, diluted from 400 to 450 times in water, and applied at intervals of 11 or 12 days, or somewhat oftener if the temperature in the greenhouse is higher than that at which marguerites are usually kept. The picking of leaves, it would seem, is in most cases neither adequate nor satisfactory."

A bibliography of the literature relating to this subject is appended.

Life history of the melon fly, E. A. BACK and C. E. PEMBERTON (*U. S. Dept. Agr., Jour. Agr. Research*, 3 (1914), No. 3, pp. 269-274).—This paper reports the results of studies of the life history of *Bactrocera* (*Dacus*) *cucurbitæ* as worked out by the authors in the Hawaiian Islands, where, next to the Mediterranean fruit fly, it is the most important insect enemy of fruits and vegetables. Brief accounts of this species by Van Dine (*E. S. R.*, 18, p. 61) and by Marsh (*E. S. R.*, 25, p. 461) have been previously noted.

While first recorded in November, 1898, it is said to have been known about Honolulu for many years before. The pest has spread so rapidly that it is now found on all the important islands of the Hawaiian group, and cantaloups and watermelons can not be grown except on new land distant from old gardens. More than 95 per cent of the pumpkin (*Cucurbita pepo*) crop is annually ruined and havoc is caused among the more resistant cucumbers (*Cucumis sativus*). The fly not only oviposits in the fruit but more often—with the pumpkin and squash—in the unopened male and female flowers, in the stem and vine, and even in the seedling itself, especially in seedlings of the watermelon and cantaloup. Entire fields of watermelons have been killed before the plants were 6 to 8 in. long by the larvæ boring into the taproot, stem, and leaf stalks. At certain seasons of the year nearly all the flowers are affected before they have an opportunity to bloom. In addition to cucurbitaceous crops, which are the favorite hosts, certain leguminous crops, such as string beans and cowpeas, are often badly attacked. When the preferred host plants are scarce even peaches, papayas, and similar fruits are attacked to a limited degree.

No satisfactory remedy has as yet been found to prevent the infestation, although a small percentage of the crops subject to attack may be saved through covering the young fruit with cloth or paper or, in cases of cucurbits, by burying them in the soil until they become sufficiently large to withstand attack.

Life history studies are reported in detail in tabular form. During the summer months when the daily mean temperature is about 79° F. the eggs hatch in from 26 to 35 hours after deposition, while at a mean temperature of 73.6° they hatch in from 52 to 54 hours. The larva passes through three instars; at a mean temperature of about 79° its development is completed in from 4 days, 4 hours, to 7 days. At mean temperatures ranging from 71.6 to 79.4° the pupal stage varies from 7.5 to 13 days. Adults, which emerged February 17, were as strong and vigorous 6 months and 14 days later as when they emerged. The majority of the females observed did not mate until fully 25 days after emerging. At mean temperatures averaging 75.5° oviposition did not commence until one month after emerging but continued for a number of months. Thirty-six is said to be the largest number of eggs secured from a single melon fly in one day. The daily oviposition by 10 flies is recorded, 169 eggs deposited from May 31 to August 18 by a fly which emerged February 17 and was placed on fruit May 22 being the largest number.

Observations on the larvæ of fleas, A. W. BACOT and W. G. RIDWOOD (*Parasitology*, 7 (1914), No. 2, pp. 157-175, figs. 6).—This article deals largely with the morphology of flea larvæ.

Short notes on *Anisoplia austriaca* and methods of combating it, I. V. VASSILIEV (*Trudy Būro Ent. [St. Petersburg.], vol. 7, No. 2, 2. enl. ed. (1914), pp.*

36, pls. 2, figs. 20; abs. in *Rev. Appl. Ent.*, 2 (1914), Ser. A, No. 4, pp. 259-261).—This paper discusses the biology, natural enemies, and means of control of *A. austriaca*, a lamellicorn beetle that is of considerable economic importance in southern Russia, Austria-Hungary, Syria, and Asia Minor.

About 22 months are required for the development of the larva and three weeks for the pupa. The adult beetle attacks chiefly rye, wheat, and barley at the time the grain is still soft, gnawing the seeds, and sometimes devouring them entirely. Three parasites, namely, *Tiphia femorata*, *T. morio*, and *Scolia quadripunctata*, attack the larvæ. A fungus disease due to *Entomophthora [Metarrhizium] anisopliæ* caused a high mortality among the larvæ in 1902, from 60 to 70 per cent having been destroyed in the vicinity of Kishenef. The remedial measures suggested include trap crops of wheat and rye and also maize, and reploting for the destruction of the eggs and larvæ. In south and middle Russia there are additional species of *Anisoplia*, such as *A. cyathigera*, *A. segetum*, and others, which are less injurious.

A synoptical table to facilitate the identification of the various species of *Anisoplia*, another giving the distinctive characters of the commoner lamellicorn larvæ found in the soil, and two colored plates are appended.

Description of a new African coccinellid, *Serangium giffardi* n. sp., G. GRANDI (*Bol. Lab. Zool. Gen. e Agr. R. Scuola Sup. Agr. Portici*, 8 (1914), pp. 165-178, figs. 8; abs. in *Rev. Appl. Ent.*, 2 (1914), Ser. A, No. 6, p. 348).—*S. giffardi*, collected in Nigeria and Kamerun by F. Silvestri, is said to be actively predaceous on Aleyrodidae, both in the adult and larval stages.

Description of the larva and pupa of *Sitona humeralis* and studies of the morphology of the adult, G. GRANDI (*Bol. Lab. Zool. Gen. e Agr. R. Scuola Sup. Agr. Portici*, 7 (1913), pp. 93-100, figs. 7; abs. in *Rev. Appl. Ent.*, 2 (1914), Ser. A, No. 3, p. 181).—This article relates to the morphology and biology of *S. humeralis*, the larva of which feeds on the roots of alfalfa and other species of *Medicago* (*M. sativa*, *M. lupulina*, and *M. minima*).

A nematode parasite of the olive weevil, G. DEL GUERCIO (*Redia*, 9 (1913), No. 2, pp. 233, 234; abs. in *Internat. Inst. Agr. [Rome]*, *Mo. Bul. Agr. Intel. and Plant Diseases*, 5 (1914), No. 7, pp. 967, 968).—A minute nematode, apparently a *Rhabditis*, has been observed by the author since 1911 to be a parasite of the olive weevil (*Rhynchites ruber*), an account of which pest has been previously noted (*E. S. R.*, 28, p. 455). It attacks the larvæ when they leave the olives and burrow into the ground. When inside the larva the nematode grows and reproduces so that the host becomes a center of infection for other larvæ; the infested larva eventually becomes motionless and dies.

The artificial fertilization of queen bees, F. JAGER and C. W. HOWARD (*Science*, n. ser., 40 (1914), No. 1037, p. 720).—The authors report apparent success in one of eight attempts to fertilize queen bees artificially. At the time of writing 3,000 eggs had been laid by this queen bee, all of which had produced worker bees, with the exception of four which produced drones. In every respect the brood, capping of cells, and the resulting worker bees were perfectly normal.

A little-known orchid pest (*Isosoma orchidearum*), L. A. WHITNEY (*Mo. Bul. Com. Hort. Cal.*, 3 (1914), No. 11, pp. 483-485, figs. 4).—An account is given of the life history and of control measures for *I. orchidearum*, a hymenopterian regarded by florists as one of the worst pests to which the orchid is subject.

"The most practical control measures are constant watchfulness, fumigation with a vaporizing insecticide for the adults, and the cutting and burning of infested buds. This seems like heroic treatment, but if not taken in time this insect will quickly destroy a prize collection of plants."

The chalcis-fly in alfalfa seed, T. D. URBAHNS (*U. S. Dept. Agr., Farmers' Bul.* 636 (1914), pp. 10, figs. 10).—The clover-seed chalcis-fly, accounts of which have been previously noted (*E. S. R.*, 16, p. 72; 17, p. 1089), is generally termed the alfalfa-seed chalcis-fly by alfalfa seed growers. It has increased so rapidly that its destructive work is now causing a large annual loss, in some sections even threatening the production of alfalfa seed. Investigations of it by the Bureau of Entomology of this Department were commenced in the fall of 1912 with a view to determining some practical method of control.

Its development and habits, distribution, and nature of its injury are briefly described. The percentage of the alfalfa seed crop destroyed can only be estimated by opening a large number of the seed pods and observing the infested seed. Seed pods collected in different localities and subjected to examination with a microscope showed that the chalcis fly destroys from 10 to 30 per cent of the seeds in the early crops and from 20 to 70 per cent of the seeds in the late crops. Some samples have been examined which showed that 85 per cent of the seed had been destroyed by this pest. The loss has been observed on different farms to vary from \$5 to \$60 per acre.

While the methods for its practical control are still in the experimental stage some of the fundamental practices which should be carried out by every alfalfa seed grower to obtain immediate results include harvesting severely infested crops, cleaning fence lines and ditch banks, winter cultivations, destroying the screenings, burning fence lines and check ridges, planting clean seeds, cutting the seed crops, stacking the seed crop, destroying bur clover, and cleaning the seed. The necessity of organized efforts is emphasized.

Contributions to our knowledge of the British Braconidæ.—II, Macrocentridæ, with descriptions of two new species, G. T. LYLE (*Entomologist*, 47 (1914), Nos. 617, pp. 257-262, pl. 1; 618, pp. 287-293).—This second paper (*E. S. R.*, 31, p. 159) deals with Macrocentrus, species of which are gregarious or solitary parasites of larvæ of Lepidoptera, and with Zele, species of which are solitary parasites of the larvæ of Lepidoptera.

A new proctotrypoid egg parasite from the West Indies, A. P. DODD (*Ent. News*, 25 (1914), No. 8, p. 350).—A telenomid reared from eggs of a leaf-hopper (*Ormenis* sp.) collected at Rio Piedras, P. R., is described as *Phanurus flavus* n. sp.

Report of a trip to Africa in search of fruit fly parasites, F. SILVESTRI (*Bol. Lab. Zool. Gen. e Agr. R. Scuola Sup. Agr. Portici*, 8 (1914), pp. 3-164, figs. 70).—A translation of this paper has been previously noted (*E. S. R.*, 31, p. 455).

FOODS—HUMAN NUTRITION.

Coloring matter of raw and cooked salted meats, R. HOAGLAND (*U. S. Dept. Agr., Jour. Agr. Research*, 3 (1914), No. 3, pp. 211-226, pls. 2, fig. 1).—In this paper are reported a number of spectroscopic and chemical analyses of salted meats.

"The red color of fresh lean meat, such as beef, pork, and mutton, is due to the presence of oxyhemoglobin, a part of which is one of the constituents of the blood remaining in the tissues, while the remainder is a normal constituent of the muscles. When fresh meat is cooked or is cured by sodium chlorid, the red color changes to brown, owing to the breaking down of the oxyhemoglobin into the two constituents, hematin, the coloring group, and the proteid, globin.

"On the other hand, when fresh meat is cured by means of a mixture of sodium chlorid and a small proportion of potassium nitrate, or saltpeter, either as a dry mixture or in the form of a pickle, the red color of the fresh meat is

not destroyed during the curing process, the finished product having practically the same color as the fresh meat. Neither is the red color destroyed on cooking, but rather is intensified."

The results of this investigation may be briefly summarized as follows:

"The color of uncooked salted meats cured with potassium nitrate, or saltpeter, is generally due, in large part at least, to the presence of NO-hemoglobin, although the color of certain kinds of such meats may be due in part or in whole to NO-hemochromogen.

"The NO-hemoglobin is produced by the action of the nitric oxid resulting from the reduction of the saltpeter used in salting upon the hemoglobin of the meat.

"The color of cooked salted meats cured with saltpeter is due to the presence of NO-hemochromogen resulting from the reduction of the color of the raw salted meat on cooking."

A list of cited literature is appended.

Changes in composition of peel and pulp of ripening bananas, H. C. GORE (*U. S. Dept. Agr., Jour. Agr. Research*, 3 (1914), No. 3, pp. 187-203, fig. 1).—Four ripening experiments are described, two of which were carried out with a respiration calorimeter in cooperation with the Nutrition Investigations of the Office of Experiment Stations and two in an especially designed constant-temperature humidior which is described. Measurements were made of the carbon dioxide, the water vapor and heat produced, the oxygen consumed, and the variation in weight during ripening. Analyses of the green and ripened fruit were carried out to determine the changes in composition. The results of these experiments are summarized as follows:

"The usual carbohydrate changes—saccharification of starch, with formation of sucrose and invert sugar, and consumption of sugars in respiration—proceeded with uniformity in bananas of different bunches.

"The period of most rapid respiration corresponded closely with that of most rapid starch hydrolysis.

"The quantities of ash, protein, and ether extract underwent but slight changes during the ripening of the bananas. Pentosans decreased markedly in the pulp, but remained little changed in the peel.

"Analyses of the peel and pulp of ripening bananas showed a steady transfer of water from peel to pulp during ripening."

A bibliography is appended.

Soluble aluminum compounds—their occurrence in certain vegetable products, C. N. MYERS (*Pub. Health Rpts. [U. S.]*, 29 (1914), No. 25, pp. 1625-1629).—In connection with the investigations of the cause of pellagra, a study was made of the aluminum content of a number of vegetable foods, including corn and corn products, hominy, oatmeal, parsnips, carrots, and white and sweet potatoes. As this aluminum is present largely in a water-soluble form, the conclusion is drawn that a relatively large consumption of aluminum may result in the case of a diet consisting chiefly of vegetables. The need of further work along this line is emphasized.

Syrian food products exported to United States, W. S. HOLLIS (*Daily Cons. and Trade Rpts. [U. S.]*, 17 (1914), No. 243, pp. 284, 285).—A number of native food products are briefly described.

Food production and requirements of various countries, N. C. MURRAY and F. ANDREWS (*U. S. Dept. Agr., Farmers' Bul.* 641 (1914), pp. 20-22).—A compilation of data showing the percentages of foods imported and exported by the United Kingdom, France, Russia, Germany, Austria-Hungary, Belgium, Argentina, Canada, and the United States. The figures given are based largely upon data for the years 1912 and 1913.

[Food analysis and other pure food and drug topics], E. F. LADD and ALMA K. JOHNSON (*North Dakota Sta. Spec. Bul.*, 3 (1914), No. 12, pp. 201-216).—This discusses the sale of undrawn poultry, the use of bleached flour, and miscellaneous food topics. Directions are also given for the disinfection of rooms, furniture, clothing, etc. Analyses are reported of a large number of foods and beverages and some samples of spirits of camphor.

[Food and sanitary inspection—food analysis and other pure food and drug topics], E. F. LADD and ALMA K. JOHNSON (*North Dakota Sta. Spec. Bul.*, 3 (1914), No. 13, pp. 217-232).—The sanitary scores are reported of a number of places where food is prepared, sold, or distributed. A list of foods and beverages analyzed is appended, and information is given regarding the prohibition of the use of soap bark and saponin, and the use of saccharin.

Food, water, and ice supplies in railway stations and railway trains, S. J. CRUMBINE (*Trans. 15. Internat. Cong. Hyg. and Demogr. Washington*, 5 (1912), Sect. 7, pp. 220-232).—The author discusses the need for sanitary regulations and points out conditions which should be remedied.

The results of analyses by N. P. Sherwood of 78 samples of drinking water taken from trains are given. Five of the samples showed at least 10 colon bacilli [an organism always present in human feces] in 10 cc. of water. One of these samples also showed *Bacillus pyocyaneus*, a green pus organism. "Waters in this group are decidedly unfit for drinking purposes." This was the worst condition noted. Eight samples showed from 6 to 8 colon bacilli in 10 cc. of water. "These waters are open to strong suspicion and should not be drunk." Fourteen samples showed from 1 to 4 *B. coli* in 10 cc. of water, and, in addition, 2 of them showed *Streptococcus pyogenes*. In 49 samples colon bacilli were not noted.

It is pointed out that the pollution in the samples might be due to the original water supply, to the water used in the ice, to dirt adhering to the ice, to the hands which had handled the ice, to the buckets, wheelbarrows, or tongs used in carrying or handling it, or to carelessness in washing the tanks either as to thoroughness or as to the kind of water used for the purpose.

Information was also gathered by the author regarding the source of the water and ice furnished passenger trains in Kansas. "All the sources of the water supplies investigated showed them to be good, potable water; inspections of the ice used in coolers quite often revealed the presence of dirt in artificial as well as in natural ice. . . .

"From these data, and after making a sanitary survey of conditions, it seems that there is no excuse for so many samples having a body temperature count of over 350 [micro-organisms] per cubic centimeter, and the conclusions we believe to be fairly drawn are that these high counts show carelessness both in cleaning the coolers and in handling the ice. Evidently the abolishment of the common drinking cup in railroad trains will not of itself insure a wholesome water supply, but very definite regulations concerning the proper cleansing and sterilization of all coolers and a sanitary method of handling the ice or, better still, cooling the water through coils covered with ice, must be insisted upon before the health of the traveling public is efficiently and uniformly safeguarded from infectious water-borne diseases."

In the discussion which follows the paper, A. J. McCannel states that he had collected from several large railway systems information regarding the methods of handling the drinking water supply on trains. He found that in a large percentage of cases no bacterial or chemical examination of the water had been made and in most cases no regular examination. While most of the water presumably came from pure sources, in a few instances it was reported that it came from wells deserving of suspicion.

"Concerning the care of water coolers, nearly all were reported to be washed out at longer or shorter intervals. This washing, in most instances, is just a rinsing with cold water and a whisk broom, or something of the kind. About half are scalded or otherwise disinfected at intervals of from two days to a month. Some are 'scalded when needed,' and about 50 per cent not at all."

The handling of the ice for trains is considered and the possibilities of contamination from various sources are pointed out.

The author states that in examining samples of water from the coolers he found colon bacilli present in some cases where the bacterial count was very small. "The fact that most of the water in the cooler comes from melting ice would account for the lower bacterial count, and this would indicate also that the colon bacilli present had come from the handling of the ice on its way to the cooler. The remedy for this contamination of water is to have the coolers so arranged that the ice is not placed in the water, but is used only for cooling purposes."

In discussing the general question, J. W. Kerr pointed out that the improvements which have been introduced in railway sanitation should not be overlooked, and stated that in his opinion "the railway officials have kept abreast of the general public in this matter, and, in some directions, they have been ahead of it. . . . As people become better educated in sanitary matters they will demand improved conditions and get them, but the necessity for improved conditions must be recognized, and it is one of the immediate duties of the health authorities to teach the people."

Things which the public should know concerning sanitary conditions in interstate meat packing establishments, G. H. SHAW (*4. Internat. Cong. School Hyg., Buffalo, N. Y., Trans., 3 (1913), pp. 22-28*).—This paper outlines briefly the sanitary conditions in federally inspected establishments and the advances made in recent years under the supervision of the Bureau of Animal Industry. It also points out the need of supplementing federal work by efficient state and municipal inspection.

The modern installation of a manufactory for butchers' goods as a part of an abattoir, P. GODBILLE (*Hyg. Viande et Lait, 8 (1914), Nos. 1, pp. 1-18, figs. 9; 2, pp. 64-75, figs. 5*).—Machinery and equipment used in preparing for market calf's heads, sheep's trotters, etc., and similar butchers' goods are described.

Judging from a hygienic standpoint the aluminum alloy, "duralumin" as material for making household utensils, G. FENDLER and W. STÜBER (*Hyg. Rundschau, 24 (1914), No. 2, pp. 59-62; abs. in Chem. Zentbl., 1914, I, No. 7, p. 693*).—According to the experimental investigations reported, this material, like aluminum, is to be regarded as harmless from a hygienic standpoint.

School hygiene—a report of the Fourth International Congress of School Hygiene, held at Buffalo, N. Y., August 25-30, 1913, W. C. RYAN, JR. (*U. S. Bur. Ed. Bul. 48 (1913), pp. 121*).—This report includes a brief summary of the proceedings of the congress and some of the most important papers, and also concrete data of the school hygiene movement as shown in the scientific exhibit made under the direction of the congress and in connection with it. The two subjects receiving the most attention at the congress were open-air schools and sex hygiene, but school architecture and equipment, medical and dental inspection, the feeding of school children, their classification according to mental ability, and kindred subjects were also considered.

School restaurants, L. MEYER (*4. Internat. Cong. School Hyg., Buffalo, N. Y., Trans., 5 (1913), pp. 340-343*).—A description of the organization and operation of Parisian school restaurants (cantines).

The administration of school lunches in cities, ALICE C. BOUGHTON (*4. Internat. Cong. School Hyg., Buffalo, N. Y., Trans., 5 (1913), pp. 304-308*).—This paper includes a discussion of the advantage of the central over the individual school kitchen in city school systems, the importance of accurate classified accounting, the equipment of kitchen and lunch rooms, the relation of the lunch department to medical inspection and to the department of charities, and the question of financing lunch rooms.

History and development of lunches in high schools, JULIA PULSIFER (*4. Internat. Cong. School Hyg., Buffalo, N. Y., Trans., 5 (1913), pp. 324-328*).—The facts upon which this paper is based were obtained from the lunch rooms of the Boston high schools similar statements from St. Louis and from Bradford, England, being used for comparison.

The conclusion is that a central kitchen from which the food is distributed to various schools is more economical than individual kitchens. In general the cost is determined by the same factors as in a commercial enterprise, but the varying amounts of rent, equipment, fuel, etc., supplied free by the schools make it difficult to estimate or compare the actual cost in the various institutions.

High school lunches under school board control, EMMA SMEDLEY (*4. Internat. Cong. School Hyg., Buffalo, N. Y., Trans., 5 (1913), pp. 329-333*).—This paper gives an account of the work done by the department of high school lunches recently established by the board of public education in Philadelphia. The organization and running of the lunch rooms is described. Each is in charge of a dietitian who plans the menus and oversees the preparation and serving of the food, and who is in constant consultation with the superintendent of the department. The latter is responsible for all purchases.

The training of the school dietitian, CAROLINE L. HUNT (*4. Internat. Cong. School Hyg., Buffalo, N. Y., Trans., 5 (1913), pp. 334-339*).—Recognizing that the school dietitian as distinct from the manager of the school lunch room is likely to become a regular officer in city school systems, this paper enumerates as necessary qualifications an understanding of child nature and also of the principles of pedagogy and nutrition, business ability, and practical knowledge of methods of investigation and research along these lines.

Medical inspection and the nutrition of school children, I. S. WILE (*4. Internat. Cong. School Hyg., Buffalo, N. Y., Trans., 5 (1913), pp. 266-272*).—This paper gives a plea for the more general recognition of the close interdependence of malnutrition (as distinct from simple underfeeding) in the physical defects of school children.

The importance of proper nutrients for retarded children—a demonstration, W. W. ROACH (*4. Internat. Cong. School Hyg., Buffalo, N. Y., Trans., 4 (1913), pp. 415-421, figs. 6*).—A report of the work of the so-called "food clinic" of a Philadelphia public school in which 113 undeveloped children were given luncheons of milk and cereal, with the result that they showed gains not only in physical development but also in mental ability.

Unwholesome diet a prime cause of inefficiency in school children, J. H. KELLOGG (*4. Internat. Cong. School Hyg., Buffalo, N. Y., Trans., 4 (1913), pp. 96-105*).—The author discusses the effects of nutrition on general efficiency and favors a vegetarian diet.

National conservation and nutrition during childhood, MARGARET McMILLAN (*4. Internat. Cong. School Hyg., Buffalo, N. Y., Trans., 5 (1913), pp. 298-302*).—The author emphasizes the moral and social as well as the physiological value of school lunches for children in crowded city districts.

The coefficient of nutrition in Antwerp school children, M. C. SCHUYTEN (*4. Internat. Cong. School Hyg., Buffalo, N. Y., Trans., 4 (1913), pp. 106-108, fig. 1*).—The author used Oppenheimer's formula for the coefficient of nutrition

(the circumference of the upper arm $\times 100 \div$ the chest measurement = the coefficient) as a measure of the condition of nutrition among school children in Antwerp. The average results are summarized as follows:

The coefficient of nutrition decreases regularly for both boys and girls between the ages of three and seven, and then shows a slight but irregular increase. During the period when the decrease is regular its curve follows Ameline's logarithmic law of biological phenomena. See also a previous note by Tuxford (E. S. R., 32, p. 256).

Feeding men in logging camps, R. S. KELLOGG (1914, pp. 8, table 1).—This paper, which was presented at the quarterly meeting of the Northern Hemlock and Hardwood Manufacturers Association, held in Milwaukee, Wis., October 28, 1914, gives practical suggestions for reducing the cost of food in Michigan and Wisconsin lumber camps. Among the points noted are the substitution of fish and dried meats for fresh meat, the reduction of the number of kinds of breads, pies, etc., served at a single meal, and especially the employment of a well-trained and intelligent cook.

A table is appended giving standard menus for 30 days and suggesting possible substitutions for certain of the staples included.

Hygienic interpretation of recent changes in the field rations and their preparation, H. C. FISHER (Trans. 15. Internat. Cong. Hyg. and Demogr. Washington, 5 (1912), Sect. 8, pp. 834-838).—The present garrison and haversack rations of the U. S. Army are discussed. In the author's opinion they are more satisfactory than the type of rations hitherto supplied.

The garrison ration, according to the components selected (and there is considerable range of choice in all the principal articles), will furnish from 2,500 to 5,674 calories. The haversack ration will furnish, it is assumed, 113 gm. proteid, 218 gm. fat, and 489 gm. carbohydrates, with a total fuel value of 4,448 calories.

The haversack ration consists of meat or bacon with other foods, the haversack utensils giving an opportunity to cook the bacon. "The hard bread furnished for the haversack ration, and formerly our main dependence for field use, is excellent within its limitations, but lacks a pleasing taste, palls upon the appetite, and undoubtedly tends to gastro-intestinal complaints on account of its hardness."

It is the author's opinion that "the recent improvements in the field rations and the means of preparing them provide a dietary for soldiers that leaves but little room for improvement. While the haversack ration is somewhat meager, the provision for supplementing it affords a sufficient but not an excessive amount of nourishment. It is a wise provision that supplies young men undergoing the necessary exertion and hardship of a soldier's life with an abundance of wholesome food, and a large experience of practical life has demonstrated that this class of men requires the ample food supply provided."

Information is given regarding the emergency ration, which weighed 8 oz. and consisted of chocolate liquor, nucleo-casein, malted milk, egg albumin, powdered cane sugar, and cocoa butter. "It furnished 52 gm. proteid, 72 gm. fat, 110 gm. carbohydrates, with a [fuel] value of 1,334 calories. The ingredients are compressed into 3 cakes resembling a chocolate confection and inclosed in a sealed tin can. It is pleasant to the taste and may be eaten without further preparation.

"There seems to be considerable question about the desirability of an emergency ration, and the equipment board recommended that an additional haversack ration be substituted for the emergency ration now carried by each soldier in campaign."

A hygienic interpretation of the food supplied the United States Army in the field, as at present authorized, A. A. WOODHULL (*Trans. 15. Internat. Cong. Hyg. and Demogr. Washington, 5 (1912), Sect. 8, pp. 830-833*).—The U. S. Army garrison and haversack rations are described and discussed. The author gives reasons for believing that the present haversack ration of the U. S. Army is better than the rations which it has replaced. Some information is given regarding an emergency ration formerly in use.

Value to the army in changes in the ration and its preparation, M. A. ELLIOTT, JR. (*Trans. 15. Internat. Cong. Hyg. and Demogr. Washington, 5 (1912), Sect. 8, pp. 839-845*).—The garrison field and emergency ration of the U. S. Army is discussed and information given regarding camp cookery in permanent and temporary camps and at daily camps from day to day.

The straight fire knockdown field oven, which is described, has been found very satisfactory. The field bread answers the same purpose as the hard bread which it is intended to replace, namely, it is prepared to contain the smallest volume and least weight compatible with the retention of all the nutritive elements of the flour, while it can be kept in good condition for a long time. The field bread is better liked than hard bread and is believed to digest more thoroughly on account of its more porous texture. "At a temperature of 37° C. [98.6° F.] field bread takes up four times its weight of water, while hard bread will take up only half as much. Plunged in boiling water field bread is soaked in six minutes, while hard bread requires more than ten. . . .

"Also, field bread is less subject to attacks from insects than hard bread; in the latter they develop quite readily, owing to its foliated texture. The insect, once admitted through any crack in the crust, easily gains the interior of the loaf and develops therein without hindrance, and no brushing can dislodge it. This the cellular structure of the field bread prevents. The external cracks are rare compared with the size of the loaf and the aeration holes throughout its surface. It is found, too, that a very prolific source of mold is the recrystallization of the salt, and it is sought to do away with this by using perfectly pure salt and by straining the water in which it has been dissolved, so as to prevent any deposit therein."

The method of making field bread is described.

Problems of growth, T. B. OSBORNE and L. B. MENDEL (*Amer. Jour. Physiol., 53 (1914), No. 3, p. XXVIII; Jour. Chem. Soc. [London], 106 (1914), No. 618, I, p. 450*).—A brief note on studies previously noted (*E. S. R., 31, p. 558*).

[Raw and cooked protein foods].—Use of protein in kidney diseases, G. LINOSSIER (*Med. Klinik, 9 (1913), No. 52, pp. 2143, 2144*).—According to the author, protein substances, when thoroughly cooked, exercise no harmful effects upon the kidneys. His conclusion applies to egg albumin, meats, and milk. He attributes the alleged superiority of white to red meat in the diet of nephritics to the fact that the white meat is generally more thoroughly cooked.

Variations in the hydrogen ion concentration of the urine of man accompanying fasting and the low- and high-protein regeneration periods, P. E. HOWE and P. B. HAWK (*Proc. Amer. Soc. Biol. Chem., 3 (1913), No. 1, p. 42*).—A summary of a paper presented at the eighth annual meeting of the American Society of Biological Chemists at Philadelphia, Pa., December, 1913.

The hydrogen ion concentration of the urine was studied with a man during a 7-day fasting period, a subsequent 4-day period of low-protein diet, and a final period of 5 days in which a high-protein diet was given similar to that of the normal period before the fast. The hydrogen ion concentration rose the first three days and remained practically constant during the remainder of the fasting period. On low-protein diet it fell gradually, and upon the resumption of a

high-protein diet continued to fall for three days, when its subnormal value returned to the normal. No direct relation between the hydrogen ion concentration and the ammonia output was noted.

See also a previous note (E. S. R., 30, p. 764).

The gaseous metabolism of infants with special reference to its relation to pulse rate and muscular activity, F. G. BENEDICT and F. B. TALBOT (*Carnegie Inst. Washington Pub.* 201 (1914), pp. 168, figs. 65).—In addition to a complete review of the literature and a presentation of a number of important problems in this field, the authors report the results of observations upon 37 infants.

The carbon dioxid production and the oxygen consumption were measured simultaneously by means of a respiration apparatus which was also provided with a device for registering the slightest body movement. A series of 12-hour continuous pulse records showed a sudden and considerable increase in pulse rate when crying or nursing, which returned quickly to the low level on cessation of crying or feeding. The pulse rate agreed closely with the muscular activity of the infants, as shown by the records of a swinging crib upon a kymograph. Metabolism increased or decreased accordingly as the pulse rate and muscular activity increased or decreased. An increase in pulse rate and metabolism which was independent of external activity was regarded as an indication of internal work, of which the pulse rate is suggested as an index.

Under conditions of complete muscular repose it was found that, although the smaller infants had in general the smaller total metabolism, there were sufficient exceptions to prevent formulation of a definite law. In these experiments no relationship existed between the age of the infants and the heat production per square meter of body surface, neither was there any relation between the heat production per square meter of body surface and the actual body weight, the normal weight for the age, and the expected body weight. The evidence derived from these experiments tends to show that the heat production is determined by the active mass of protoplasmic tissues which may be stimulated to various degrees of cellular activity. The intensity of this stimulus is indicated by the pulse rate.

The physiologic cost of insufficient protective clothing, G. W. FITZ (4. *Internat. Cong. School Hyg., Buffalo, N. Y., Trans.*, 2 (1913), pp. 300-305).—The author discusses the relative values of different materials and weaves for clothing, and points out the dangers of inadequate protection by clothing and the general ignorance on the part of both laymen and physicians regarding this subject.

ANIMAL PRODUCTION.

[Animal husbandry work], J. H. GRISDALE, E. S. ARCHIBALD, ET AL. (*Canada Expt. Farms Rpts.* 1913, pp. 50, 51, 75, 83, 98, 99, 523-530, 532-537, 539-542, 578-596, 598-600, 613, pls. 6).—Analyses of 23 varieties of mangels showed a dry matter content ranging from 13.38 to 7.87 per cent and sugar from 9.15 to 4.75 per cent. Though not an invariable rule, those containing the larger percentage of dry matter were the richer in sugar. In 19 varieties of turnips the sugar content was fairly constant, but much lower than in mangels. The dry matter ranged from 10.55 to 5.85 per cent. Carrots, judging from their composition, were intermediate in food value between mangels and turnips.

One lot of hogs was fed 3 lbs. of skim milk per day, another lot, 6 lbs., the other constituents of the ration being the same for both lots. Those fed the larger quantity of milk made very economical gains, a saving of 0.6 ct. per pound of increase in weight being effected.

In an effort to arrive at a ration for wintering a horse at low cost, a gelding and a mare were fed 1 lb. of hay from mixed grasses, 1 lb. of straw, and 1 lb. of swedes per day for each 100 lbs. of live weight, with very favorable results. The bulky ration and the roots had a very beneficial effect on the digestive tract of the animals.

Three lots of 12 2 to 3 year old steers each were fed the same feeds, consisting of a grain mixture of wheat, oats, and barley 1:2:2. Lot 1 was fed in the barn in box stalls, which were kept well bedded and cleaned at regular intervals. They were not let out at all except once each month for the purpose of being weighed. They had water twice a day, though it was before them practically throughout the day. They were fed straw in their mangers as well as green feed and hay during the last three weeks of the feeding period, as were also the other two lots. Lot 2 was fed in the corral, having but a very limited run, being confined near the buildings. These steers had water before them at all times and were fed their roughage in the feeding racks about the corral. They got their straw at the straw stack. The water in the tank was kept free from ice by the use of a tank heater. Lot 3 was fed in the bluff toward the western boundary of the farm; they were at liberty to run free practically over a half-section of land with access to the straw stacks and were fed green feed on the ground. They watered at a small lake through the ice.

The labor required to attend to the three lots for 109 days was 261 hours 30 minutes, 64 hours 15 minutes, and 58 hours, respectively. Lot 1 made an average daily gain per head of 1.53 lbs., lot 2 1.79 lbs., and lot 3 1.34 lbs., the average profits per head being \$10.95, \$14.05, and \$10.15 for the respective lots.

From experiments conducted with Shorthorn, Angus, Galloway, Hereford, and mixed breeds of beef cattle, it is concluded that the stall-feeding of young steers during summer months is too expensive. This was shown during the heat of July and again during the first of September, when all steers lost weight. Long feeding of steers with present high prices for grain, and particularly in the absence of pasture and alfalfa hay, leaves but a small margin of profit. The best bred steers of most uniform size and quality almost invariably gave the greatest profit over the value of foodstuff consumed, and at the same time commanded the best market price.

A number of steers and heifers were fed to demonstrate possible profits from short-keep steers or heifers of good or of poor flesh. They received a grain mixture of ground oats, ground barley, ground peas, and bran, 1:1:1:3, together with roots, silage, and mixed clover and timothy hay. From these experiments it was concluded that there is a good margin of profit in feeding steers when the feeding period is not extended over too great a time; that the type of steer commonly found in Canada, although more of dairy than of beef conformation, may be profitably finished on stall-feeding on a short keep; and that finished steers will continue to make gains, but at a much smaller margin of profit than formerly.

Three lots of 15 steers each were fed a grain ration of crushed oats, barley, bran, cotton-seed meal, and oil cake, 2:2:4:2:1, lot receiving 40 lbs. of roots and good hay, lot 2 80 lbs. roots and poor hay, lot 3 80 lbs. of roots and poor hay, and lots 1 and 2 being tied and lot 3 loose. From these experiments it is concluded that half the roots may be dispensed with when good hay is available and yet the same daily gain per steer be maintained. When the finishing period is of short duration then the high-quality foodstuffs and the narrower ration containing the higher percentage of dry matter, give greater profits. Steers in loose box stalls made greater and more economical gains than those tied.

Two lots of steers were fed for 90 days on a grain mixture of bran, crushed oats, and oil-cake meal, 2:2:1, and hay, lot 1 receiving 50 per cent more meal and roots than lot 2. From this experiment it is concluded that the greater profits per steer in finishing are obtained by the use of a heavier grain ration, in other words, the short-keep steer is more profitable than the long-keep steer. Roots are of great value in finishing, but should be used in greater proportion at the commencement of the finishing period than at the end when the quantity of meal is greatest. The most rapid gains in steer finishing accompany the heavier feeding and are the most economical.

Two lots of steers were fed for 167 days, lot 1 outside on straw, with a small quantity of corn stover and alfalfa at the last of the feeding experiment, together with a mixture of oats and barley chop, lot 2 inside on straw, turnips, and corn silage, together with a little alfalfa, oats, and barley chop. It is concluded from this experiment that steers may be fattened successfully and profitably outside, in the climate of Manitoba. Greater gains at the cost of less feed can be made where the steers can be stabled, but the increased gains from stabling are probably not sufficient to justify the expenditure for building expensive stables.

A lot of 12 two-year-old steers, fed 149 days a grain ration of wheat, barley, and oats 4:3:3, rutabagas, alfalfa hay, and oat hay, made an average daily gain per head of 1.77 lbs. at a cost of 10 cts. per pound of gain, and made a net profit per head of \$10.37. It required 10.36 lbs. of dry matter, or 8.25 lbs. of digestible matter, to produce a pound of gain.

Seven lots of wether and ewe lambs, as nearly uniform as possible, and weighing approximately 75 lbs. per head, were fed for 88 days a grain mixture of oats, barley, peas, and bran, 1:1:1:3, lot 1 receiving in addition, alfalfa hay and later additional bran, lot 2, mixed timothy hay and corn stover, lot 3, timothy and mangels, lot 4, oats and pea hay and turnips, lot 5, alfalfa hay and turnips, lot 6, mixed timothy and garden refuse (cabbage, tops of vegetables, etc.), and lot 7, timothy hay and oats and pea hay mixed together. The average daily gains per head for the respective lots were as follows: 0.102, 0.022, 0.076, 0.072, 0.144, 0.07, and 0.06 lb.; the cost of feed per pound of gain 15.25, 60.8, 16.4, 20, 12.4, 18.9, and 26 cts.; the net profit per lamb 48, 24.3, 57.2, 37.1, 79, 52, and 39.2 cts.

The average results of two years' tests with 66 lambs for 89 days of alfalfa hay *v.* mixed hay, and corn stover *v.* timothy hay and roots as roughage in fattening lambs are given as follows: Average gain per head per day 0.137, 0.052, and 0.087 lb.; cost per pound of gain, 12.5, 27.2, and 16.6 cts.; and the net profit per lamb 52, 30.2, 0.08 cts., respectively. It is concluded from these experiments that alfalfa hay is a most economical feed for fattening lambs, but is often excelled by mixtures of other less concentrated roughages which have greater succulence. Alfalfa and roots make by far the most concentrated, best balanced, and most profitable roughage for lamb feeding. Timothy hay alone is a poor roughage for sheep, but when fed in conjunction with roots or garden refuse answers fairly well and yields fair profits. Corn stover is too coarse for lambs, but when fed with roots yields a small margin of profit. Oats and pea hay did not rank as high as anticipated, but yielded a fair margin of profit. The cost per pound of gain was very high in all lots excepting where alfalfa was fed.

Four lots of 10 grade wethers each were fed for 76 days as follows: Lot 1, timothy hay, roots, and meal; lot 2, timothy hay and meal; lot 3, clover hay, roots, and meal; lot 4, clover hay and meal. They made an average daily gain per head of 0.3, 0.25, 0.31, and 0.27 lb., costing per pound of gain 9.06,

9.64, 8.95, and 8.9 cts., and giving a net profit per lamb of \$1.43, \$1.37, \$1.43, and \$1.50, respectively. It is concluded from this experiment that clover hay surpasses timothy hay in the economy of gains produced. Roots appeared to add to the economy of production, especially when applied to the timothy hay ration.

Six lots of approximately 75-lb. wethers were fed for 117 days as follows: Lot 1 (lambs), alfalfa, mixed grains, and roots; lot 2 (yearlings), alfalfa, mixed grains, and roots; lot 3 (yearlings), alfalfa and grain; lot 4 (yearlings), alfalfa and screenings; lot 5 (yearlings), alfalfa alone; lot 6 (yearlings), alfalfa and roots, made an average daily gain per head of 0.289, 0.24, 0.226, 0.242, 0.138, and 0.146 lb., costing per pound of gain 7.19, 9.03, 9.16, 5.85, 12.32, and 12.13 cts., and giving a net profit per lamb of 64, 46, 46, 138, 25, and 16 cts.

Two lots of 7 65 to 70-lb. pigs, fed 84 days a grain mixture of shorts and a proprietary feed and 5 lbs. of skim milk, lot 1 receiving in addition all the clover they would eat, made an average daily gain per pig of 1.09 and 1.19 lbs., costing per pound of gain 4.1 and 5.2 cts. From these results it is concluded that greater daily gains may be made from the grain and milk ration but more economical gains may be made by the addition to the ration of grain and good clover. The pigs receiving the clover were not as well finished but had greater bone and muscular development, appeared to be in better condition, and were at no time off feed.

Five groups of 10 pigs each, each group comprising 2 lots, were fed for 63 days winter rations as follows: Group 1, ground barley and oats 1:1; group 2, ground barley and oats 1:1 and 3 lbs. per pig per day of skim milk; group 3, ground barley and oats 1:1 and boiled turnips; group 4, ground barley, oats, and middlings 1:1:1; and group 5, ground oats, barley, and feed flour 1:1:1. They made an average daily gain per head of 0.99, 1.3, 1.03, 0.92, and 0.94 lbs., costing per pound of gain 5.6, 4.1, 5.55, 4.85, and 5.05 cts. From this experiment it is concluded that skim milk is an outstandingly cheap pork producer; that middlings is the next cheapest substitute for a part of the oats and barley meal; that for younger and light pigs feed flour is not a practical feed in large quantities; and that cooked turnips added to the meal ration economizes but little over the meal alone.

Two lots of 5 30-lb. pigs fed 132 days a grain ration, lot 1 receiving in addition 3 lbs. of skim milk per pig per day, and lot 2, 6 lbs. of skim milk, made average daily gains of 0.81 and 1.03 lbs., costing per pound of gain 5.08 and 5.2 cts., respectively. The extra milk fed to lot 2 was estimated to be worth for fattening purposes 57 cts. per 100 lbs.

Two lots of 70 to 75-lb. pigs fed 60 days a small quantity of feed flour and some mangels, lot 1 receiving in addition barley chop, and lot 2 shorts, made average daily gains per head of 0.81 and 0.58 lb., costing 4.26 and 7.4 cts. per pound of gain, respectively.

Three lots of Yorkshire pigs were fed summer rations as follows: Lot 1, wheat shorts, milk, and green feed; lot 2, wheat shorts, peas, oats, barley, rice meal, and green feed; and lot 3, oats, peas, barley (ground), milk, and green feed. They made an average daily gain per head of 1.16, 1.1, and 1.42 lbs., there being required per pound of gain 2.1, 2.76, and 2.11 lbs. of grain and 8.51, 9, and 7.03 lbs. of milk, respectively.

Four lots of four Yorkshire pigs three to six months old were fed winter rations as follows: Lot 1, rice meal, milk, and mangels; lot 2, wheat shorts, milk, and mangels; lot 3, rice meal, wheat shorts, milk, and mangels; and lot 4, oats, peas, barley, wheat shorts, milk, and mangels. They made average daily gains per head of 0.708, 1.176, 0.925, and 1.04 lbs., respectively.

[Analyses of] fodders and feeding stuffs, F. T. SHUTT (*Canada Expt. Farms Rpts.* 1913, pp. 223-241).—Analyses are reported of bran, oats, middlings, shorts, feed flour, rice meal, distillery grains, dried brewers' grains, bean meal, flax meal, tankage, molasses meals, corn silage, clover silage, oat hay, teff hay (*Eragrostis abyssinica*), and mangels, turnips, and carrots of various varieties.

The importance of the inorganic constituents of feeding stuffs, A. ZAITSCHEK (*Állatorvosi Lapok*, 37 (1914), No. 19, pp. 225-229; *abs. in Internat. Inst. Agr. [Rome]*, *Mo. Bul. Agr. Intel. and Plant Diseases*, 5 (1914), No. 8, pp. 1046, 1047).—In studies on the influence of the inorganic constituents of feeding stuffs on the development of bone in young pigs, it was found that when the animals were fed exclusively on corn they excreted more calcium than they retained and made up the deficit with magnesium. When the quantity of dry matter was increased and 5 gm. of calcium carbonate added to the ration, the amount of calcium retained was increased, the magnesium retained decreased, and the phosphoric acid retained rose from 13 to 30 per cent. Similar results were obtained when barley instead of corn was fed.

A high absorption of calcium and phosphoric acid resulted when from 10 to 11 gm. of calcium carbonate was added to the feed per 100 kg. live weight. Inasmuch as the bones did not develop properly on the grain rations the necessity of adding calcium to the ration, especially with young pigs in the dry lot, is deemed evident, but it is believed that this may be in the form of carbonate instead of the more expensive phosphate.

Influence of calcium-poor and calcium-rich nourishment on the growth and composition of the bone, S. WEISER (*Kisérlet. Közlem.*, 17 (1914), No. 4, pp. 539-558, pls. 2).—Two lots of growing pigs were fed for 8½ months on corn and blood meal, 10:1, one lot receiving calcium carbonate in addition.

In growth and body weight the animals receiving little calcium were 20 per cent lower, and their bones were deformed, flexible, fragile, and light in cross-section measurement, although the weight and growth of their skeletons was no lower than those of the lot fed the calcium-rich ration. The weight of the fresh bones and dry matter comprised a larger percentage of the body weight in the low-calcium (14.29 to 5.05) than in the high-calcium (8.74 to 3.91) lots. The water content of the bones of the low-calcium lot was the greater, the fat contents practically equal. The ash content of the bones of the low-calcium pigs was considerably lower, the greatest difference occurring in the ribs and the least in the skull. Hence the skulls of the low-calcium pigs carried a greater percentage of the total ash of the skeleton than the high-calcium lot. The bone ash of the low-calcium lot was poorer in CaO and P₂O₅, but the essential difference consisted in the higher alkali content, there being more Na₂O and K₂O in the low-calcium lot. The variations in the ash components were not alike in all the bones, being least in the skull and greatest in the ribs and spine.

On some factors controlling fertility in domestic animals, J. HAMMOND (*Jour. Agr. Sci. [England]*, 6 (1914), No. 3, pp. 263-277, pl. 1).—In a study of the factors which limit the fertility of domestic animals it was concluded that the low fertility of young as compared with adult sows is due to the fact that not so many ova are shed, it appearing that various circumstances control the number of ova shed at each heat period. "Counts have been made of the number of corpora lutea present in the ovaries and number of fetuses present in the uteri of pregnant rabbits and pigs. The results show that many more ova are shed at the heat period than young are produced at birth. Some ova possibly may be lost but many after fertilization atrophy at some period of

their development and undergo absorption in utero. While the occurrence of atrophic fetuses only causes reduced fertility in animals which have many young at birth yet their occurrence in animals producing only one young would give rise to sterility so that the problem of the cause of the atrophy becomes an important one.

"Investigation points to the conclusion that the atrophy is not bacterial in origin since frequently healthy and atrophic fetuses lie side by side in the tuerus. Moreover, no bacteria could be found either in the fetus or fetal membranes. Evidence is given to show that nutrition can not be the cause of the atrophy although it may affect to a certain extent the size of the young. No conclusion has yet been arrived at as to the cause of the atrophy, and the several possibilities suggested are still under investigation."

Influence of Röntgen rays on ovaries, M. FRAENKEL (*Arch. Mikros. Anat.*, 84 (1914), No. 3-4, II, pp. 111-118, pl. 1, figs. 6; *abs. in Jour. Roy. Micros. Soc. [London]*, No. 3 (1914), p. 241).—In experiments with guinea pigs subjected to Röntgen rays on the fourth day after birth growth was retarded and when mature the offspring were undersized. Their offspring were undersized also and were sterile. It is stated that "in the experiments several servings and pregnancies were failures. A hair defect was produced by the rays on the head of the first animal, and a similar defect appeared on the same place in the next generation, and similar cases were observed. All the animals showed an accumulation of fat. Cystic degeneration of the ovaries was observed in the sterile forms."

Coat pattern in mammals.—A medium of real value to the breeder, since it enables him by analysis to detect in many cases the genetic composition of his animals—Mendelism in the hands of the fancier, Q. I. SIMPSON (*Jour. Heredity*, 5 (1914), No. 8, pp. 329-339, pl. 1, figs. 6).—The author recounts his experiences in crossing Tamworth, White Yorkshire, and Belted-Black Hampshire swine, in an effort to found a new race of Belted Reds.

From these observations he concludes that "the fancier and the Mendelist may synthesize color and pattern to their likings. Starting with dominant white found on some individual, family, or race, among mammals or fowls, he may borrow from another of the species the dye, from yet another the stencil, and create unique marking, [and] that Mendelism, the result of chromosome shuffling and segregation at the sexual preparation of egg and sperm, is the breeder's fractionating column and analytical balance. It enables him to separate and weigh the determining entities that make visible the types, and then to resynthesize these to his uses and his fancies."

A bibliography is included.

Inbreeding in dogs.—Statistical study of the pedigrees of two typical breeds; inbreeding not so commonly practiced by dog fanciers as popularly supposed and not so productive of results as line-breeding, W. HAYNES (*Jour. Heredity*, 5 (1914), No. 8, pp. 368, 369).—From a study of the pedigrees of the Airedale and Scottish terrier breeds of dogs, the author estimates the percentage of inbred animals in these breeds at three and seven per cent, respectively, thus discrediting the popular view that these dogs are closely inbred.* Further it was found that of 100 Scottish terrier champions one is inbred, and of 100 Airedale champions two are inbred. However, the figures on line-breeding are different, for of the 100 Scottish terrier champions 9 were bred in this way, 8 from the half brother and sister with same sire, and 1 from the half brother and sister with the same dam, and 10 Airedale champions were so bred, 9 from the half brother and sister with the same sire, and 1 from the half brother and sister with the same dam. The author concludes that line-

breeding has, in the cases of these two breeds, at least proved very much more effective than inbreeding in accomplishing the object desired.

Utilization of feed by range steers of different ages.—I, Alfalfa hay, F. W. CHRISTENSEN and H. H. SIMPSON (*New Mexico Sta. Bul. 91 (1914)*, pp. 2-128, figs. 8).—Range steers varying in age from calves to 3-year-olds were fed on alfalfa hay alone for 120 days.

At the end of the feeding period the yearlings and 2-year-olds were not on the whole as highly finished as the calves or 3-year-olds. All the 3-year-olds presented a well-finished appearance and in every way were better finished and developed than the calves, although they did not compare favorably with grain-fed steers. The calves showed lack of finish especially over the ribs and in the forequarters.

The calves, yearlings, 2-year-olds, and 3-year-olds made average daily gains per head of 1.67, 1.33, 1.55, and 1.03 lbs., respectively. Per 1,000 lbs. live weight the daily gains per head were 3.18, 2.22, 2.15, and 0.96 lbs., respectively, and the amounts of feed consumed daily were 24.44, 23.29, 23.51, and 18.42 lbs., respectively. Per pound of gain the amounts consumed were 7.77, 11.11, 11.46, and 20.34 lbs., respectively.

A series of 24 digestion trials was conducted, 8 steers being used. The results of these trials show considerable variation with the same individual, in successive trials, and among the different individuals on corresponding trials. However, there appeared to be no definite or consistent superiority of one individual over any other, or of any given age of steer over another. Since the older steers apparently digested the feed equally as well as the calves, it appears that their digestive powers were not impaired by the starvation of sub-maintenance periods through which they had passed. There was apparently no direct connection between the quantity of feed consumed and the digestibility of the ration, nor any difference in digestibility due to stage or fattening. It is suggested, however, that the steers were not especially fat nor on very heavy rations.

Two comparisons of the nitrogen balances of the calves and the 3-year-olds indicate that the calves were gaining considerably in nitrogen whereas the others were either losing nitrogen or making but small gains, thus indicating a relatively greater gain in protein by the calves. It was estimated that the energy content of the gains made increased in general with the age of the animal. From slaughter tests there was little difference found between the yearlings and 2-year-olds, but 3-year-olds dressed a considerably higher percentage of beef than the calves. In pounds of dressed beef per head, the 3-year-olds averaged approximately twice as much as the calves. "A consideration of the wholesale cuts of beef from one side of the carcass shows that although the cuts differ greatly in weight, not only among the steers of different ages but among individuals of the same age, they show no very marked difference when expressed in percentages of the half carcass. A comparison of the calves and 3-year-olds, however, shows higher percentages for ribs and loin cuts with the older steers, indicating a relatively greater proportion of the high-priced cuts in these steers.

"It was found that the 2-year-olds, compared with the yearlings, showed more internal and external fat, as well as a better distribution of the same. In general, the meat of the older steers was firmer and better in quality, having slightly finer grain and better color, but the differences between the two ages were not great. The grain of the meat of both ages appeared a little coarser than that of corn-fed steers. The meat was tender, juicy, and of good flavor, and aside from the fact that the meat from the older steers appeared a little fatter, there was no marked preference due to age.

"A comparison of the carcasses of the calves and 3-year-olds . . . shows that not only was the covering of fat greater on the 3-year-olds, but the fat was more abundant throughout the carcasses and better distributed through the lean. The cuts of the older steers were relatively thicker than corresponding cuts from the calves, and were more finished and plump in appearance. The meat of the older steers was firmer and of better quality, but except for individual variations there was no marked difference in color."

A separation of the bone, lean, and visible fat showed that, in general, the relative amount of fat increases with the age of the steer, and that the lean is correspondingly lower. Chemical analyses confirmed these observations. The cuts from the 3-year-olds contained approximately twice as much fat as the corresponding cuts from the calves, but the increase in the fat content of the loin and rib cuts of the older steers appears relatively greater than in the round and shoulder cuts.

Beef cattle production and cooperative breeders' organizations, R. S. CURTIS, K. C. IKELER, and J. L. BROWN (*North Carolina Sta. Circ. 22 (1914), pp. 3-20, figs. 12*).—This circular treats of the improvement of the beef herd, and discusses the origin, purpose, and method of organization of cooperative breeders' organizations.

[Sheep feeding experiments], A. D. FAVILLE (*Wyoming Sta. Bul. 103, pp. 3-7*).—Five lots of 24 grade Rambouillet lambs each, weighing approximately 44 lbs. each, were fed 110 days, beginning November 26, as follows: Lot 1 whole corn, lot 2 dry whole barley, lot 3 soaked whole barley, lot 4 cracked barley, lot 5 barley meal, all the lots receiving alfalfa hay. They made 0.36, 0.34, 0.33, 0.32, and 0.33 lb. average daily gain per lamb for the respective lots. The average daily ration per lamb was 2.7 lbs. alfalfa hay and 0.72 lb. grain. It is estimated that it required 7 per cent less grain and 6½ per cent less alfalfa for 100 lbs. gain when corn replaced barley in a ration. Whole dry barley proved fully as satisfactory as did soaked, cracked, or ground barley.

Experiments in winter lamb production, J. W. HAMMOND (*Ohio Sta. Bul. 270 (1914), pp. 199-223, figs. 3*).—Two lots of 12 Delaine ewes each, with their October or November lambs from a Southdown ram, as nearly alike as possible with regard to age, weight, conformation, and breeding, were fed for 62 days, beginning December 19, as follows: Lot 1, corn and oil meal 4:1, alfalfa, and silage; lot 2, corn, oats, bran, and oil meal 5:2:2:1, alfalfa, and silage. The nutritive ratio of the two rations was approximately the same. The hay and silage were fed ad libitum and approximately the same amount of grain was fed, it being all that they would consume. The lambs were fed alike, receiving corn and alfalfa. The ewes of lot 1 made an average daily gain per head of 0.095 lb., those of lot 2, 0.129 lb.; the lambs of lot 1, 0.441 lb., and of lot 2, 0.411 lb. The cost of feed per pound of gain made by the lambs was 7.1 and 7.5 cts., respectively. No appreciable differences in degree of finish from the two rations were noted. Both lots produced prime hothouse lambs.

Two lots of 11 ewes each, with their lambs, were fed for 95 days, beginning December 24, the same ration as in the above experiment, except that during the last five weeks clover hay was substituted for the alfalfa. As these lambs were not intended for hothouse lambs they were not forced so rapidly as those in the first experiment. The average daily gain per head of the ewes of lot 1 was 0.013, of lot 2, —0.031 lb.; for the lambs of lot 1, 0.377 lb., of lot 2, 0.333 lb. The cost of feed per pound of gain made by the lambs was for lot 1, 8.7 cts. and for lot 2, 10.1 cts.

Two lots of 38 ewes each, with their lambs, were fed for 95 days, beginning December 24. The ewes received the same ration as those in the second experiment. The lambs of lot 1 received corn and alfalfa hay; those of lot 2, corn, oats, bran, and oil meal 5:2:2:1, and alfalfa hay. The hay was fed ad libitum and both lots received approximately the same amount of grain. The ewes of lot 1 lost 63 lbs. in weight; those of lot 2 gained 51 lbs. The lambs made an average daily gain per head of 0.322, and 0.315 lb., respectively, costing 8.9 and 8.5 cts. per pound of gain. The lambs of lot 1 were heavier and in higher condition than those of lot 2.

Hothouse lambs, born the last of November and first of December 1911-12, were fed an average of 102.25 days and weighed when slaughtered 56.8 lbs. each, having made an average daily gain per head of 0.465 lb., and dressing 50.33 per cent. The cost of feed required per pound of live weight was 5.6 cts.; the selling price, 35 cts. per pound, and the net profit per lamb, including pelts, wool, and gains made by the ewe mothers, was \$6.84. In the 1912-13 trial the net cost of feed required per pound of live weight was 5.2 cts. and the profit per lamb, \$4.08.

Hothouse lambs, born in July and August and maintained on clover pasture and a small amount of grain until November 25, and then fed in the barn, were produced at a smaller cost for feed than were lambs born in the fall and raised in the barn during the winter, the cost of feed required per pound of live weight being 4 cts. and the net profit per lamb, \$5.35.

[Hog production], B. AUNE (*U. S. Dept. Agr., Bur. Plant Indus., Work Belle Fourche Expt. Farm, 1913, pp. 7-9*).—From experiments conducted at the Belle Fourche Experiment Farm, S. Dak., it is estimated that the net value of gains per acre of alfalfa made in 74 days by 153-lb. hogs, fed a supplementary feed of 2 lbs. per day per 100 lbs. live weight, of a grain mixture of ground wheat, oats, and barley, was \$11. The average yield of alfalfa hay was estimated at 3.5 tons per acre and its market value at \$5 per ton. Pigs weighing 39 lbs. pastured on third crop alfalfa for 20 days made a net gain of \$10.12 per acre, which was equivalent to about \$9 a ton for the alfalfa consumed. On September 15 these young hogs were allowed to hog down a plat of 34 bu. per acre corn. They remained in the corn 11 days, making a gain of 560 lbs. per acre, which was estimated to be worth \$39.20, or \$1.13 per bushel for the corn consumed.

Judging draft horses, A. S. ALEXANDER (*Wisconsin Sta. Circ. 53 (1914), pp. 3-36, figs. 43*).—This circular gives general instructions on the judging and scoring of horses and the detection of unsoundness.

The horse in North Africa, E. AUREGGIO (*Bul. Soc. Sci. Vét. Lyon, 17 (1914), No. 3, pp. 203-266, figs. 24*).—An account of the development and use of the various native breeds of horses in North Africa, and of the influence of the introduction of the Barb, Arabian, and Syrian breeds upon the native stock.

Report from the poultry division, V. FORTIER and F. T. SHUTT (*Canada Expt. Farms Rpts. 1913, pp. 671-682, pl. 1*).—In experiments comparing the effect of open and cotton-front poultry houses on egg production, it was found that there was in general a higher egg yield from the cotton-front house during the winter and early spring months. The minimum temperature in the cotton-front house was 6° F., and in the open front -10°.

Two pens of 14 White Leghorn hens each were used to determine the effect of a reduction of ration on forced molting. The effect of the restricted ration was to stop entirely the egg yield 15 days after the beginning of the experiment, but the recovery from the molt was more rapid than in the instance of the lot full fed and consequently the greater number of eggs was secured in the early fall or the months of limited supply. Toward the end of the starvation period,

or about July 25, the starved pen showed distinctly by the appearance of the birds and the number of molted feathers in the pen and runs, that the method of forcing the molt by reduced ration and starvation had been successful. It was also noted that about two weeks after the starved pen had returned to a full ration the hens were still ravenous for their feed, and cleaned it up quicker than those in fed pen. This was no doubt due to the fact that they were ahead of the fed pen in the process of molting and growing new feathers. By August 29, 50 per cent of the hens in the starved pen were again laying, whereas only 14.4 per cent in the fed pen were laying.

In a comparison of the fattening capacity of cockerels and capons, it was found that the latter in a period of 70 days gained approximately 50 per cent more than the former.

Lime water as an egg preservative is discussed, and trials reported in which it was superior to a commercial preservative.

How to tell the age of hens and pigeons, V. FORTIER (*Canada Dept. Agr. Bul. 16, 2. ser. (1913), pp. 19, figs. 21*).—This bulletin describes methods of determining the age of hens by the condition of the spur, the color, scales, and general appearance of the leg, the character of the down and epidermis, and the appearance of the wing as affected by the molt. It appears that "the number of short secondaries that are found in the wing indicates the number of molts that the bird has gone through, or, in other words, tells its age. These feathers are shorter than the rest, more rounded at the extremity, with a nearly central quill, and they end in a short straight point, slightly projecting."

Likewise the age of pigeons may be determined by the appearance of the wings as affected by the molts.

DAIRY FARMING—DAIRYING.

[Dairy husbandry], J. H. GRIDDALE, E. S. ARCHIBALD, H. T. GÜSSOW, ET AL. (*Canada Expt. Farms Rpts. 1913, pp. 34-37, 478-480, 543-577, pls. 11*).—From experiments conducted to determine the feeding value for dairy cattle of black-strap molasses, it was found that when molasses replaces a meal (composed of bran, gluten meal, cotton-seed meal, and dried brewers' grains 6:3:2:2) pound for pound to the extent of 10 per cent of total meal fed, it proves quite satisfactory; this is due probably in large measure to the increasing of the palatability of the feed. When molasses replaced the meal to the extent of 20 per cent, the cows dropped in their milk flow and milk cost, to produce, more per hundred pounds; it is worthy of note that on the 20-per cent molasses ($1\frac{1}{2}$ to 2 lbs. per day) the cows gained in weight and condition. When molasses replaced meal to the extent of 30 per cent, the cows dropped heavily in milk flow and milk cost more per hundred pounds. This quantity of molasses slightly scoured the cows and caused loss in body weight.

Estimates of returns from four herds show that the profits over feed between calvings (labor, manure, and calf not included) ranged between \$52.98 and \$96.69 per head for the year.

Comparisons made of the bacterial content of machine and hand-milked samples of milk showed a considerably greater number of bacteria in the former than in the latter. In dairy records taken of one herd it was found that the cost of food for the five most profitable cows, whose average production of milk was 9,637.2 lbs., and of fat 344.2 lbs., was \$54.27, while the profit per cow was \$117.83. With the five least profitable cows, whose average yield was 6,136.2 lbs. of milk and 208.6 lbs. of fat, the cost was \$36.62 and the profit \$67.68.

Plans of several dairy barns are included.

[Feeding value of grasses], N. ATHANASSOF (*Rev. Vet. e Zootech.*, 4 (1914), No. 5, pp. 287-293, pls. 4).—Experiments are reported in which the grasses *Melinis minutiflora* and *Andropogon rufus* were fed to dairy cattle as roughage. It was demonstrated that both grasses materially increased the live weight of the cows and with the former the milk production was increased, but with the latter it was lowered.

Feeding dried tomato seed to dairy cattle, G. SCARPITTI (*Indus. Latt. e Zootec.*, 12 (1914), No. 14, pp. 213, 214).—Successful trials are reported in feeding dried tomato seed to dairy cattle, it appearing that this product has a nutritive value slightly higher than linseed meal, its composition being given as follows: Moisture 10.1, protein 38.13, fat 11.63, nitrogen-free extract 29.43, fiber 5.9, and ash 4.81 per cent. The feeding of this material resulted in an increased yield of milk and an increase in live weight.

Dairying in Nevada, C. A. NORCROSS (*Nev. Bur. Indus., Agr. and Irrig. Bul.* 9 (1914), pp. 158, figs. 42).—This gives general information on the breeding, feeding, care, and management of dairy cattle under Nevada conditions.

What dairying has done for Denmark, J. J. DUNNE (*Hoard's Dairyman*, 1914, Dec. 25, pp. 633, 653, 654; 48 (1915), No. 23, pp. 672, 673, 680, figs. 4).—A general account of the development of the dairy industry in Denmark during the past 35 years, the growth of the cooperative societies, and the effect of the industry on the system of farm management, changing it from one of crop growing to one of milk and live stock production.

The cost of milk production (*Hoard's Dairyman*, 48 (1915), No. 23, pp. 669, 670, figs. 3).—Reports from various state stations on the cost of milk production are cited and commented upon. It is concluded that \$40 in the West and \$60 in the East is a fair estimate at which to place the fixed charges per cow per year, after deducting the value of the calf and the manure. It was also shown that as the production increases the cost increases but not nearly in proportion to the increase in the value of the milk.

The effect of the volatile fatty acids of the nutritive fats on the milk secretion.—Porpoise oil, C. BEGER (*Landw. Vers. Stat.*, 85 (1914), No. 1-2, pp. 155-167).—Porpoise oil fed to two goats in one case increased the milk secretion and the Reichert-Meissl number, while in the other case it did not, there being an actual depression.

Studies in the expansion of milk and cream, H. W. BEARCE (*U. S. Dept. Agr., Jour. Agr. Research*, 3 (1914), No. 3, pp. 251-268).—Studies were undertaken by the Bureau of Standards of the Department of Commerce, for the Dairy Division of this Department, to determine the coefficient of expansion of market milk, single cream, and double cream. The principle employed in determining the rate of expansion was to measure the change of density with change of temperature and from that to calculate the change in volume. The density determinations were made by the method of hydrostatic weighing. Several sources of error are to be taken into account—the difficulty of accurate weighing owing to the nonhomogeneity of the milk and cream samples; a difference in the assumed percentage of fat and the actual percentage, due to the loss occurring in handling; temperature observations; and weighings of the sinker. Tables are given showing the observed densities of milk and cream, the densities of milk and cream corresponding to various percentages of fat, observed and calculated densities of milk and cream at different temperatures and with different percentages of fat, and the volume of milk and cream at various temperatures occupied by a unit volume at 68° F.

“Examination of the results shows that for the individual samples examined the density determinations may be depended upon to about one unit of the

fourth decimal place. These values, however, when plotted, present certain irregularities which are far too great to be accounted for by errors in the determinations. For example, four different samples were examined, each of which was supposed to contain 30 per cent of fat. The densities of the four samples at 35° C. were found to be in satisfactory agreement, and for each sample the agreement between the observed and calculated densities at other temperatures was such as to throw no suspicion upon the determinations; and yet the rate of expansion of the four samples was widely different. Only one out of the four fitted reasonably well into the series formed by the samples above and below 30 per cent.

"This and similar anomalies for certain other samples make it appear that the rate of expansion of any given sample depends upon something more than the density or the percentage of fat present. It undoubtedly depends upon the physical and chemical condition of the sample at the time the observations are made. This condition is probably largely dependent upon the time that has elapsed since the preparation of the sample and upon the temperature at which it has been kept. That being the case, it would probably be impossible to find any fixed relation that would express accurately the rate of expansion of all percentages of butter fat under all conditions."

These studies have been referred to in another source (E. S. R., 31, p. 575).

The iron content of human and cow's milk, F. VON SOXHLET (*München. Med. Wchnschr.*, 59 (1912), No. 28, pp. 1529-1532).—This article reviews the work of a number of investigators, comparing the iron content of human and cow's milk.

Composition of sheep milk, G. BIRÓ (*Ztschr. Untersuch. Nahr. u. Genussmitl.*, 27 (1914), No. 5, p. 397; *abs. in Chem. Zentbl.*, 1914, I, No. 18, p. 1690).—This is in continuation of work previously noted (E. S. R., 28, p. 374). Tests made of 262 samples of sheep milk from a Hungarian market showed an average ash content of 0.75, fat 7.87, and dry matter 19.7 per cent. The highest fat content was 10.45, and of dry matter 22.98 per cent.

The chloroformic coagulation of milk, E. POZERSKI (*Compt. Rend. Soc. Biol. [Paris]*, 76 (1914), No. 17, pp. 812, 813).—It was noted that coagulation resulting from the use of a chloroform preservative was increased by the leucocyte content of the milk.

Note on the nonlactose fermenters in fresh milk, J. RITCHIE (*Jour. Hyg. [Cambridge]*, 14 (1914), No. 3, pp. 393, 394).—Of the 61 samples of milk examined only 7 samples proved to contain nonlactose fermenters, and from these 8 organisms were obtained.

"In regard to the general bacteriological condition of these samples, lactose fermenters were absent from 1 cc. in 1 case, present in 1 cc. in 2 cases, in 0.1 cc. in 3 cases, and in 0.001 cc. in 1 case."

The feeding of cattle and the production of hygienic milk, C. GORINI (*Clin. Vet. [Milan]*, *Rass. Pol. Sanit. e Ig.*, 37 (1914), No. 11, pp. 447-453).—The author comments on the sources of bacterial infection of milk, one of the principal of these being the food. The bacteria carried from the food to the feces are, under insanitary conditions, transferred to the milk. Fermented feeds from the silo, beet pulp, and sugar products are the principal sources of these bacteria. Likewise the drinking water may be a source of infection.

The milk supply as a causal factor in relation to tuberculosis, S. DELÉPINE (*Jour. State Med.*, 22 (1914), Nos. 11, pp. 671-682; 12, pp. 718-731).—This is a general summary of the observations and arguments which have been used for and against the view that the milk bears a causal relation to tuberculosis. Especial mention is made of the conditions in Manchester, England, where there

has been a material reduction in the mortality from tuberculosis during recent years, due largely to the improvement in the milk supply. It is concluded that although there is not complete agreement in the results obtained by various observers as to the exact amount of human tuberculosis attributable to the consumption of tuberculous cows' milk, there is clear and cumulative evidence that cows' milk plays a very important part in the production of infantile tuberculosis in England and Scotland.

Market milk, F. G. BOUDREAU (*Vet. Alumni Quart. [Ohio State Univ.]*, 2 (1914), No. 3, pp. 85-98).—This treats of the pathogenic bacteria found in milk, their rate of multiplication and their effect upon public health. Epidemics of typhoid fever, diphtheria, scarlet fever, and septic sore throat, traceable in contaminated milk are cited, and the method of contamination described. It is stated that all raw milk is potentially dangerous, but that pasteurization properly done by the holding method will render milk safe. The necessity of adequate municipal control of the milk supply is commented upon.

The care of milk and cream, T. A. F. WIANCKO (*Brit. Columbia Dept. Agr. Bul.* 9 (1914), pp. 6).—This bulletin gives general instructions on the care of milk and cream on the dairy farm.

Instruction in the schools concerning sanitary milk, E. KELLY (*4. Internat. Cong. School Hyg., Buffalo, N. Y., Trans.*, 3 (1913), pp. 38-43, fig. 1).—The author considers the public schools an excellent means of combatting ignorance and carelessness regarding the milk supply. He gives a synopsis of desirable instruction and a list of the U. S. Department of Agriculture publications on the subject.

Biorization of milk, O. G. NOACK (*Amer. Jour. Vet. Med.*, 9 (1914), No. 12, pp. 859-861).—An explanation of the recently invented apparatus and method of biorizing milk previously referred to (*E. S. R.*, 31, p. 276).

The dairy industry act, 1914, and regulations, J. A. RUDDICK (*Canada Dept. Agr. Dairy and Cold Storage Comr. Branch Bul.* 42 (1914), pp. 13).—This gives the text of the Canadian Dairy Industry Act of 1914, regulating the manufacture and sale of dairy products.

[Overrun in butter], L. F. ROSENGREN (*Milchw. Zentbl.*, 42 (1913), No. 24, pp. 713-721; 43 (1914), No. 1, pp. 1-9, figs. 4).—This reports tests made of the fat content, dry matter, fat-free dry matter, and fat in the dry matter, of buttermilk from various grades of milk. Formulas are given for estimating the probable overrun in butter.

[Causes and effects of uneven composition of butter], F. W. BOUSKA (*N. Y. Produce Rev. and Amer. Cream.*, 39 (1914), No. 6, p. 328, figs. 11).—The uneven composition of churned butter, due to improper salting, maladjustment of workers, overloading, improper working, and other causes, is discussed.

The microflora of Liptauer cheese and their importance in the ripening and flavoring, O. GRATZ and K. VAS (*Centbl. Bakt. [etc.]*, 2. Abt., 41 (1914), No. 18-23, pp. 481-545, fig. 1).—A variety of micro-organisms were found, the majority, however, being of an accidental character, coming from the air, water, salt, and other sources. The ripening of the cheese is not dependent upon these accidental flora but upon the lipolytic enzymes of the rennet, which work upon the fats and in turn affect the flavor of the cheese.

Ripening of Neufchatel cheese, O. LAXA (*Ztschr. Untersuch. Nahr. u. Genuss-mtl.*, 28 (1914), No. 8, pp. 387-392).—This reports studies made of the chemical changes occurring in Neufchatel, Camembert, and other varieties of cheese in the process of ripening.

VETERINARY MEDICINE.

The importance of enzymes and enzyme reactions in medicine and surgery, W. G. LYLE and P. A. KOBER (*Jour. Indus. and Engin. Chem.*, 6 (1914), No. 10, pp. 855, 856).—A paper on the topic which was presented before the New York section of the American Chemical Society in July, 1914.

The diagnosis of pregnancy in the bovine, sheep, and goat by the dialysis method, J. RICHTER and J. SCHWARZ (*Ztschr. Tiermed.*, 17 (1913), No. 10, pp. 417-458; *abs. in Berlin. Tierärztl. Wchnschr.*, 29 (1913), No. 51, pp. 913, 914).—With the dialysis method (E. S. R., 31, p. 278) it was possible to note placenta-cleaving protective ferments in the blood serum of pregnant bovines, sheep, and goats in the sixth week of pregnancy and upwards. From the fourth to the eighth month of pregnancy the diagnosis can be made in 100 per cent of the cases but during the ninth month it becomes uncertain. Within the first four weeks post parturition the ferments can also be noted in the sera of the animals mentioned, and in some cases for a much longer period. Inaccurate results are obtained if the directions are not strictly adhered to.

Organic arsenic preparations and their chemotherapeutic significance, M. NIERENSTEIN (*Samml. Chem. u. Chem. Tech. Vorträge*, 19 (1912), No. 2-3, pp. 47-140).—This deals with the history and chemistry and the various theories (Ehrlich's reduction theory, Breinl and Nierenstein's oxidation theory, and Uhlenhuth's partial cell function theory) relating to the action of arsenicals as antiparasitocides in spirochete, trypanosome, and similar diseases. The publication is one of the collection of chemical and chemotechnical lectures edited by F. B. Ahrens.

The biological decomposition of arsenic compounds, H. HUSS (*Ztschr. Hyg. u. Infektionskrankh.*, 76 (1914), No. 3, pp. 361-406; *abs. in Chem. Zentbl.*, 1914, I, No. 8, pp. 801, 802).—Not many fungi have the power of decomposing arsenic compounds. Under favorable conditions of air, moisture, and with a suitable substratum, some evolve gases which do not appear to be very toxic. The insoluble compounds and those sparingly soluble are decomposed with greater difficulty than the soluble compounds. These "arsenic fungi" are found in all manner of places, but in small number compared with the other micro-organisms which accompany them. *Penicillium brevicaulis*, one of the most active, was not found in living rooms, whereas *Actinomyces* sp., which is quite as active, frequently occurs in isolated groups on moist walls and other places.

Principal poisonous plants of the western stock ranges, C. D. MARSH (*U. S. Dept. Agr., Bur. Plant Indus., Principal Poisonous Plants of the Western Stock Ranges* (1914), pp. 13, figs. 6).—This circular presents photographic illustrations and brief descriptions of poisonous plants on the western stock ranges which it is most necessary for the stockman to avoid, namely, *Zygadenus*, or death camas; lupine; loco, white loco, or rattlesnake weed; tall larkspur; low larkspur; and cicuta, or water hemlock.

Suckered roundworms from India and Ceylon, C. LANE (*Indian Jour. Med. Research*, 2 (1914), No. 2, pp. 655-669, pls. 8).—A number of genera and species are described for the first time.

Studies concerning glycosuria and diabetes, F. M. ALLEN (*Boston*, 1913, pp. XVIII+1179, pls. 8).—This large work represents the results of three years of research in the laboratory of Preventive Medicine and Hygiene of the Harvard University Medical School. It includes many experiments on animals and contains an extended review of the literature.

The microbiology of the infectious diseases of animals, J. COUERMONT and L. PANISSET (*Précis de Microbiologie des Maladies Infectieuses des Animaux*.

Paris, 1914, pp. III+1054, figs. 371).—This work describes the methods germane to microbiology and treats of the micro-organisms causing disease, especially in animals, with numerous illustrations.

Filterable viruses, K. F. MEYER (*Amer. Vet. Rev.*, 46 (1914), Nos. 2, pp. 132-144; 3, pp. 265-280; *abs. in Vet. Rec.*, 27 (1914), Nos. 1365, pp. 157-159; 1366, pp. 167-171).—A paper presented at the Tenth International Veterinary Congress held at London in 1914.

Contagion by immunization, J. LAW (*Amer. Jour. Vet. Med.*, 9 (1914), No. 7, pp. 490-497).—Chiefly a criticism of the terms used to-day in immunology.

A study of the metabiotic action of ultraviolet rays.—Modification and heredity of characters in the anthrax bacillus, MME. V. HENRI (*Compt. Rend. Acad. Sci. [Paris]*, 159 (1914), No. 4, pp. 340-343, pl. 1).—The author has followed up the work previously reported (*E. S. R.*, 31, p. 379) with a further study of the anthrax bacillus as affected in its morphological and biochemical characters by culture under the influence of ultraviolet rays.

The characteristic arrangement of the bacilli in filaments was strongly modified when grown in an alkaline or saccharin medium. The form and size of the rods were also changed. Other characters showing considerable alteration were responsiveness to the Gram stain, production of pigments, and formation of amylolytic and proteolytic ferments. The persistency of the characters so acquired was noteworthy; changes tending toward the normal form were induced in one strain by passage through the guinea pig.

Report of the departmental committee appointed by the Board of Agriculture and Fisheries to inquire into foot-and-mouth disease, S. STOCKMAN, J. McFADYEAN, and A. E. METTAM (*Rpt. Dept. Com. Bd. Agr. and Fisheries [Gt. Brit.]*, *Foot-and-Mouth Disease, 1914*, pp. 32, figs. 6; *abs. in Jersey Bul. and Dairy World*, 34 (1915), No. 1, p. 11).—This is a report of a departmental committee appointed by the Board in June, 1912, to make an investigation of the characteristics of foot-and-mouth disease and the manner in which it is contracted and spread.

The investigation was carried out in India. The total number of animals employed in the experiments was 228, including 165 cattle, 23 buffaloes, 9 sheep, 11 goats, and 20 pigs. Infection was attempted by contact, intravenous inoculation, scarification, subcutaneous inoculation, and feeding.

In 49 experiments embracing 147 animals the results were entirely negative. In the remaining 18 experiments with 81 animals of which 37 became infected the results were as follows: Intravenous inoculation infected 12 cattle and 3 buffaloes, and failed to infect 10 cattle and 1 buffalo; inoculation by scarification infected 8 cattle and 1 pig (2 doubtful), and failed to infect 4 cattle and 1 buffalo; subcutaneous inoculation infected 1 pig and failed to infect another; and contact with diseased animals led to the infection of 6 cattle and 1 buffalo, and failed to infect 12 cattle, 3 sheep, and 5 goats.

In the great majority of cases the period of incubation after intravenous inoculation was two days, but in one animal the first lesions developed on the tenth day after inoculation. In cases of infection produced by scarification the period of incubation varied from two to eight days and after contact from three to 13 days.

In 25 cases the period within which ulcers developed in the mouth did not exceed 24 hours, but in 12 new cases fresh vesicles appeared on two or more successive days. It was found that in the morning ulcers might be present in the mouth of an animal which on the previous evening showed no abnormality of the mucous membrane.

Foot-and-mouth disease in the Dutch East Indies, A. VRIJBURG (*Tijdschr. Veeartsenijk.*, 41 (1914), No. 1, pp. 12, 13; *abs. in Rev. Gén. Méd. Vét.*, 23 (1914),

No. 272, pp. 439, 440).—The Dutch East Indies are regularly visited by this disease, but its importance is lessened by the fact that the production of milk and butter is very small and the animals nearly all employed as beasts of burden.

Immunization of imported cattle against northern Rhodesian piroplasmosis and anaplasmosis, F. CHAMBERS and J. SMITH (*Jour. Compar. Path. and Ther.*, 27 (1914), No. 2, pp. 155–171, figs. 2).—As a result of this work, the first inoculation on a large scale of northern Rhodesian cattle, it is believed that the most suitable age for the purpose of immunization against piroplasmosis and anaplasmosis is from 10 to 15 months. The best method of immunizing imported cattle against local piroplasmosis and anaplasmosis is to give a subcutaneous injection of 10 cc. of citrated blood containing the *Babesia bigemina* and *Anaplasma centrale*, followed 14 days later by an injection of from 4 to 6 cc. of local blood containing the *B. bigemina* and *A. marginale*.

Experimental polyneuritis.—Effects of exclusive diet of wheat flour in the form of ordinary bread on fowls, W. R. OHLER (*Jour. Med. Research*, 31 (1914), No. 2, pp. 239–246, pl. 1).—“From the results of these experiments it can be stated with certainty that when fed on an exclusive diet of white bread, whether with or without yeast, fowls develop a definite polyneuritis. This condition has been demonstrated by histological studies of both nerve and muscle tissue.”

A note on the effect of heat on the rinderpest-immune bodies, J. D. E. HOLMES (*Agr. Research Inst. Pusa Bul.* 43 (1914), pp. 10).—Tests were carried out in order to ascertain whether exposure to a moderately high temperature for several days or to a high temperature for a short period had any detrimental effect on rinderpest-immune bodies. Another object of the experiments was to determine the effect of sterilization on the potency of the serum.

It was found that rinderpest antiserum does not become changed in potency by short exposure to high temperature, and that the sterilization of this serum can be accomplished without detriment to the value of the serum. The action of rinderpest antiserum is not dependent upon the complement contained therein. Immune bodies are not altered when exposed to a temperature of 60 to 65° C. for a period of an hour, whereas the complement of serum is destroyed by heating to 55° for half an hour.

According to the results it seems probable that rinderpest serum obtains a suitable complement in the body of injected cattle. One liter of fresh immune serum which showed no reaction in vitro upon ox corpuscles when intravenously given resulted in a very darkly stained urine. This is deemed proof that a suitable complement was present in the body of the animal.

A case of tetanus treated by injections of carbolic acid, P. STEWART and J. T. C. LAING (*Brit. Med. Jour.*, No. 2817 (1914), p. 1098).—The results obtained in the treatment of a man 27 years of age, here reported, are thought to exemplify the efficiency of the carbolic acid treatment of tetanus, originally introduced by Baccelli some 15 years ago.

Contribution to the study of the treatment of tetanus, CAILLAUD and CORNIGLION (*Compt. Rend. Acad. Sci. [Paris]*, 159 (1914), No. 19, pp. 664–667).—Injections of carbolic acid alone cured two cases of tetanus of average severity, and phenol injections combined with intravenous injections of lantol or colloidal rhodium cured two other very severe cases. The application of the same treatment in five cases in Cannes where the mortality was high resulted in five cures.

Reflections and investigations on the occurrence of tubercle bacilli in the circulating blood, E. FISCHER (*Ztschr. Hyg. u. Infektionskrankh.*, 78 (1914),

No. 2, pp. 253-300).—A review of the literature in this regard with a report of the author's observations.

The microscopical examination of the blood of tuberculous guinea pigs (artificially infected) and human beings for detecting the presence of tubercle bacilli resulted negatively in all cases. The best method for this purpose is said to be the animal test and eventually the culture test. Animals infected with the blood of tuberculous subjects in 96 per cent of the cases gave a negative finding. The administration of tuberculin did not seem to cause a mobilization of the tubercle bacilli.

Report on the infection of children with the bovine tubercle bacillus, A. P. MITCHELL (*Brit. Med. Jour.*, No. 2768 (1914), pp. 125-133, pl. 1; *abs. in Jour. Compar. Path. and Ther.*, 27 (1914), No. 1, pp. 85-87).—For the purpose of obtaining definite statistical evidence as to the relative frequency of the bovine and human types of tubercle bacilli in cases of disease of the cervical glands in children, 72 consecutive cases were studied. In 65 of these the tubercle bacillus of the bovine type was responsible and in the remaining 7 the disease was due to the human type.

The intradermic tuberculin test applied to the eyelid, G. MOUSSU (*Bul. Soc. Cent. Méd. Vét.*, 91 (1914), No. 6, pp. 130-133, figs. 2; *abs. in Jour. Compar. Path. and Ther.*, 27 (1914), No. 3, pp. 266, 267).—This method was suggested by the Lanfranchi test for the diagnosis of glanders, but differs in that a fine syringe is used and the tuberculin is injected into the thickness of the skin of the lower eyelid. "The point selected is about opposite the middle point of the lid and 1 cm. from its free border. The dose of tuberculin used is 0.1 cc. It is not stated what kind of tuberculin is used. Two figures taken from drawings show the type of reaction obtained. In the tuberculous animals the eyelid becomes edematous and swollen, and the eye appears sunken. The results are quite as striking as those obtained with the method when applied to the caudal folds.

"In clinically affected animals the author has observed a steady increase in the reaction up to the thirty-sixth hour, at which hour it is at its maximum. The reaction would therefore appear to be produced earlier and to disappear earlier than when the test is applied to the anal fold. Contrary to what has been found by Lanfranchi in his mallein tests, there has been no evidence of any ophthalmic reaction, save that some lachrymation has been observed."

Experimental study of the chicken as a possible typhoid carrier, O. W. H. MITCHELL and G. T. BLOOMER (*Jour. Med. Research*, 31 (1914), No. 2, pp. 247-250).—"From the work done it would seem that the chicken is highly resistant to the typhoid organism. It not only fails to take the disease, but also, as these experiments seem to indicate, it can not be made a carrier either by feeding the organism or by intravenous inoculation. The limited time, however, in which the work was pursued and also the limited number of chickens used must be borne in mind in weighing the evidence adduced by these experiments, and a greater number of experiments covering a longer period should be done before it is said absolutely that the chicken can not become a typhoid carrier."

Agglutination affinities of a pathogenic bacillus from fowls (fowl typhoid) (*Bacterium sanguinarium*, Moore) with the typhoid bacillus of man, T. SMITH and C. TENBROECK (*Jour. Med. Research*, 31 (1915), No. 3, pp. 503, 521).—"A description of the fowl typhoid bacillus was first published by V. A. Moore in 1895 [*E. S. R.*, 9, p. 890] and named by him *B. sanguinarium*. In 1913 Pfeiler and Rehse [*E. S. R.*, 30, p. 385] described this organism anew under the name *B. typhi gallinarum alcalifaciens*. We have shown that it has many diagnostic features in common with the human typhoid bacillus, among them

the behavior toward carbohydrates and the agglutination reactions. Its agglutinative relation to the paratyphoid (paracolon) and the dysentery group is weak as regards the former and negative or nearly so as regards the latter. It differs from the typhoid bacillus in being nonmotile."

The pathogenic action of the fowl typhoid bacillus with special reference to certain toxins, T. SMITH and C. TENBROECK (*Jour. Med. Research*, 31 (1915), No. 3, pp. 523-546, fig. 1).—The investigations reported, which are based upon a large number of experiments made during the past four years, have demonstrated the presence of a toxin in filtrates which appears as early as the end of two days in cultures kept at 37° C. The medium chiefly used was peptonized veal broth plus 0.1 per cent dextrose in shallow layers. The prompt effect on rabbits by the intravenous route leading to death within two hours is said to be in many respects like an anaphylactic shock. While the authors have not presented any definite proof that the fowl typhoid bacillus plays any part in the food or so-called ptomaine poisoning in man, they believe that this organism should be searched for in any study of the cause of such outbreaks.

A note on the relation between *B. pullorum* (Rettger) and the fowl typhoid bacillus (Moore), T. SMITH and C. TENBROECK (*Jour. Med. Research*, 31 (1915), No. 3, pp. 547-555).—"The bacillus of fowl typhoid as studied in the type cultures I and II differed from *Bacillus pullorum* in that recently isolated strains of the latter produced a little gas in both dextrose and mannite bouillon or in dextrose only. We can not affirm at present whether any strains of the fowl typhoid bacillus produced gas when freshly isolated, or whether certain freshly isolated strains of *B. pullorum* do not produce gas. In our strains the total amount of gas produced by any strain did not exceed 30 per cent of the closed arm of the fermentation tube.

"A second difference between the two types is determined by maltose. This is acidified by fowl typhoid bacilli, and not by *B. pullorum*. In other respects the types are alike. Toxin production is identical and differences in immunological reactions have not been found.

"Strains of *B. pullorum* which do not produce gas might be mistaken for *B. dysenteriae* (Shiga) unless serological tests (agglutination) are resorted to and mannite included in the fermentation tests. They might be mistaken for the Flexner type unless serological tests are applied. So-called nonmotile strains of the typhoid bacillus can be differentiated from the fowl typhoid group only by careful morphological studies. The gas production of *B. pullorum* is of a fluctuating character which seems to disappear during artificial cultivation.

"The statement made by Hadley [E. S. R., 26, p. 185] that the fowl typhoid bacillus probably belongs to the fowl cholera (rabbit septicemia) group is disproved by so many facts that it need not be specially considered.

"The terminology of this group is likely to become confusing if, at present, we identify with each other the fowl typhoid and the pullorum types. A better plan would be to adhere, for the time being, to the separation, until a much larger number of races have been carefully studied, and fluctuating and permanent differences recorded. If these organisms should prove to be a species in the making which has not yet acquired its final characters, other variations than those to which we have referred may be encountered."

Influence of sickness of cattle on the milk, F. ZARIBNICKY (*Arch. Wiss. u. Prakt. Tierheilk.*, 40 (1914), No. 4-5, pp. 355-381).—In this study it was found that the fat content is quite variable in disease, in some cases there being a rapid rise in fat content and in others a reduction, ranging from 1.7 per cent with cows affected with mastitis (E. S. R., 27, p. 878) to 19.5 per cent with

those affected with foot-and-mouth disease. There were some variations in the milk sugar content but not so great as in the fat, the majority of cases ranging from 4.5 to 5.5 per cent with several cases as low as 1. In ash content there was as a rule little variation from the normal. Except in cases of abnormally high or low fat content, the specific gravity of the milk varied but little from the normal. The casein content appeared to be lower than the normal except in cases of mastitis and foot-and-mouth disease. Among the diseases studied were mastitis, foot-and-mouth disease, intestinal catarrh, endometritis, pyelonephritis, and diseases of the respiratory organs.

Some drugs recently used in veterinary practice, J. N. FROST (*Cornell Vet.*, 4 (1915), No. 4, pp. 190-193).—The author states that during the year four herds in which infectious mastitis was spreading rapidly were treated with methylene blue. Each cow was given 60 grains, followed by a dose of 30 grains the following night and morning. In all cases treated the dose was sufficient to cause the milk to be colored. Rapid recoveries followed in all the herds without the loss of a single quarter or the production of a hard milker. It is stated that one of these herds had been troubled nearly every year by infectious mastitis with the loss of the udder or a section of it and the production of hard milkers by the formation of fibrous growths, commonly called spider in the teat canal.

Kidney worm infestation of swine in the Philippine Islands with special reference to the pathological changes, W. H. BOYNTON (*Philippine Jour. Sci.*, Sect. B, 9 (1914), No. 3, pp. 269-289, pls. 3).—This report of studies of the pathological changes induced by the kidney worm (*Stephanurus dentatus*) is based upon the examination of pigs imported into the Philippines.

Infestation with *S. dentatus* is characterized by muscular pains, tenderness to pressure over the kidneys, weakness, loss of appetite, emaciation, and partial or complete paralysis of the hind quarters. "The parasites may be located in the fat surrounding the kidneys, in the ureters, and encysted in the kidneys, liver, spleen, lymph glands, and muscles and connective tissues in the region of the kidneys; also, they may be found free, slightly embedded, or encysted in the connective tissue of both peritoneal and thoracic cavities."

The age at which pigs usually die from infestation with *S. dentatus* and the lesions produced by this parasite indicate a slow-developing chronic disease. "Since the average age of pigs that are killed for meat at the Manila matadero varies from six months to one and one-half years, the disease does not have time to cause any fatal or very damaging lesions in the animals. Hence it is not looked upon as very serious in connection with meat inspection. In older animals the lesions are more serious.

"From the several autopsies made on animals, it is concluded that kidney worm infestation becomes a generalized instead of a localized disease of swine when allowed to run its course. Practically every cavity of the body may become infested."

Attention is called to the fact that observations reported by Newcomb (*E. S. R.*, 30, p. 384) show the infestation to be prevalent in native hogs slaughtered at Manila.

Hog cholera or Pintadilla, B. M. BOLTON (*Estac. Expt. Agron. Cuba Circ.* 46 (1914), pp. 16, fig. 1).—A general account of the nature of this disease, symptoms, duration, etc., vaccination, the disposition of animals that die of the disease, and the advisability of disinfecting the premises where it has existed.

Hog cholera questions and answers, F. B. HADLEY (*Wisconsin Sta. Circ.* 54 (1914), pp. 3-28, figs. 10).—This circular deals with the nature and occurrence of hog cholera in Wisconsin, its cause, diagnosis, prevention and control, and

treatment, including the use of hog cholera serum and virus and the results that have been obtained in Wisconsin.

Hog cholera and its prevention by the use of antihog-cholera serum, B. B. FLOWE (*Bul. N. C. Dept. Agr.*, 35 (1914), No. 7, pp. 29, figs. 15).—An account of hog cholera, its nature, prevention and methods of eradication. The manufacture of antihog-cholera serum is described and the bulletin is well illustrated.

Basis of the serum treatment for hog cholera, C. F. LYNCH (*Amer. Jour. Vet. Med.*, 9 (1914), Nos. 7, pp. 473-480; 8, pp. 580-583).—A brief survey of the principles underlying immunity and an account of the use of the serum and serum virus methods of treating hog cholera.

Environment as a factor in complications following vaccination for the prevention of hog cholera, S. SHELDON (*Amer. Jour. Vet. Med.*, 9 (1914), No. 7, pp. 489, 490).—"After a herd has been properly vaccinated, it should be placed in a paddock or pasture where mudholes and stagnant pools are absent. . . . We feel that this is a very important matter and should be insisted upon at all times."

Conditions in which antihog-cholera serum should not be used, O. E. TROY (*Amer. Jour. Vet. Med.*, 9 (1914), No. 7, pp. 480, 481).—The tenor of this paper is that a diagnosis of hog cholera must be positively made before serum or similar treatment is employed. The serum virus method should only be used under the proper auspices.

"Unless there is immediate danger of infection, pregnant sows should not be immunized, particularly with the simultaneous method, as the immunizing process may produce abortion. Careful handling and the use of serum alone minimizes this danger. Swine that are to be introduced to noninfected premises where there are noninfected, susceptible hogs, should not be given the simultaneous treatment within 30 days of their introduction, because such immunized hogs may be virus carriers. Herds to which any new stock is being added should, as a rule, be protected unless careful quarantine of the new stock is observed. Serum alone has proved impractical on infected farms where conditions do not permit of thorough cleaning and disinfection, and in feed lots where new hogs are periodically added."

Some failures for which serum has been wrongly blamed, C. H. BUGBEE (*Amer. Jour. Vet. Med.*, 9 (1914), No. 7, pp. 484-486).—Increased caution in operation and in administering hog-cholera serum is deemed necessary. Laxity in this regard accounts for much of the failures in the use of antihog-cholera serum.

The proper time to vaccinate hogs, R. A. BRANSON (*Amer. Jour. Vet. Med.*, 9 (1914), No. 9, pp. 651, 652).—After giving his experiences in immunizing swine, the author concludes that "the proper time to vaccinate is when the pig is from six to eight weeks of age."

Care of the herd after vaccination, D. S. BURCHAM (*Amer. Jour. Vet. Med.*, 9 (1914), No. 7, pp. 483, 484).—A discussion with recommendations.

Spreading disease among coyotes, M. A. CROMWELL (*Breeder's Gaz.*, 67 (1915), No. 3, pp. 110, 111).—It is stated that the inoculation of young coyotes with sarcoptic mange mites and turning them loose at Great Falls, Mont., to infect other wild coyotes has succeeded in spreading the disease. The coyotes of that locality are said to be dying by the hundreds and in fact becoming nearly extinct in some places. The author reports that sheepmen at a recent meeting favored the removal of the bounty from coyotes, especially those that are infected with mange, and of putting more efforts and money into the disease work.

Tuberculosis in poultry, C. H. HIGGINS (*Canada Expt. Farms Rpts.* 1913, pp. 687-689).—A brief popular account.

Blackhead in turkeys (enterohepatitis), C. H. HIGGINS (*Canada Expt. Farms Rpts.* 1913, pp. 683-686).—An account of this disease and its prevention and treatment.

Lice and mites: Life history and extermination, HELEN D. WHITAKER (*Washington Sta. Popular Bul.* 74 (1914), pp. 7).—A popular account of the ectoparasites of poultry and means for their control.

RURAL ENGINEERING.

River and canal engineering, E. S. BELLASIS (*London and New York, 1913, pp. X+215, figs. 72*).—It is the object of this book to describe the characteristics of open-flowing streams and the principles and methods to be followed in dealing with them. The subject matter is presented under the following chapters: Rainfall, collection of information concerning streams, the silting and scouring action of streams, methods of increasing or reducing silting or scour, works for the protection of banks, diversions and closures of streams, the training and canalization of rivers, canals and conduits, weirs and sluices, bridges and syphons, drainage and floods, reservoirs and dams, tidal waters and works, and river bars.

Report of investigations of land settlement and irrigation development in America, E. MEAD (*Melbourne, Aust., 1914, pp. 10*).—This is a general report on the subject.

An economic phase of irrigation, A. M. PAUL (*West. Engin.,* 5 (1914), No. 4, pp. 163, 164).—The author discusses the application of the law of minimum to the use of irrigation water.

Notes on irrigation and cooperative irrigation societies in Ilocos Norte, E. B. CHRISTIE (*Philippine Jour. Sci., Sect. D,* 9 (1914), No. 2, pp. 99-113, pl. 1).—It is the object of this article to convey a general idea of the degree of development of native irrigation in Ilocos Norte and to give a detailed description of the irrigation works in Bacarra and Bintar.

Irrigation and canal building in British India, E. JACQUEZ (*Min. Agr. [France], Ann. Forêts, Hydraul. [etc.],* No. 43 (1912), pp. 337-421, pls. 5, figs. 23).—The author discusses in some detail the phases of irrigation as practiced in British India, taking up particularly methods of elevating irrigation water, irrigation canals, design and alignment of permanent canals, chutes, rapids and flumes, dams and water storage, water measurement and distribution, and administration and cost of irrigation enterprises and the resulting revenues. Discussions of the design of irrigation structures involving mathematical calculations are given and typical structures are illustrated.

Concrete lining, Franklin Canal, Rio Grande project, L. M. LAWSON (*Engin. News,* 72 (1914), No. 11, pp. 540-543, figs. 8).—The construction of the concrete lining necessary to increase the canal capacity is described and illustrated. A 4-in. thickness of concrete was placed with forms on a $1\frac{1}{2}$:1 slope. Cost data are also given.

The reclamation of the Zuider Zee, J. M. FIGEE (*Engin. News,* 72 (1914), No. 16, pp. 778-780, figs. 2).—A system of reclamation by means of dikes and steam pumping plants whereby about 800 square miles will be drained and made available for agricultural purposes is described and illustrated. It is estimated that this project will cost about \$130,000,000 and will require 33 years for completion.

The cost of tile drainage: A study of the cost of installing thirty-five miles of tile drains on a farm in Huron County, Ohio, L. H. GODDARD and H. O. TIFFANY (*Ohio Sta. Circ.* 147 (1914), pp. 21-44, figs. 7).—This circular pre-

sents an approximately accurate record of the expense of the various operations performed in installing 11,395 rods of tile for the purpose of draining areas totaling 228 acres.

The work was done in part by hand trenching and in part by machine trenching. Practically all the soil of the farm is of glacial origin and the principal type is clay loam containing a large percentage of silt. The surface soil consists of clay or heavy silt loam about 9 in. deep, which gradually becomes heavier with the depth until at 18 to 24 in. it is a clay which becomes decidedly plastic at a depth of 3 ft. The lower lying soil consists mainly of a dark-colored clay loam or clay, varying greatly in depth and underlain by a very stiff bluish clay.

The tiling operations of the first year were largely confined to hand trenching, while the work of the other two years was mainly done by machine trenching. The power tile ditching machine used was equipped with a caterpillar tractor. The machine was equipped to do work at four different rates of speed which were used according to depth of digging and stickiness of dirt. Dry ground had no effect upon the machine except to dull the knives, and soil frozen to a depth of 4 in. and the freezing of wet earth to the machine caused little trouble. During the greater part of the season the machine could be operated satisfactorily immediately after heavy showers. Round stones or boulders in the ditch line caused more or less trouble, depending upon the location in the ditch, the size of the stones, etc. Boulders the size of a man's head were removed by the machine with comparative ease but when larger than this it was necessary to raise the digger wheel and remove them by hand.

A comparison of machine trenching with hand trenching shows the former to have an advantage in cost of 7.4 cts. per rod. Another point in favor of the ditching machine is the speed which can be maintained, it being shown that the machine operators use less than one-sixth as much labor per rod in trenching and laying tile as is spent when the work is done by hand. "Considering the scarcity of labor and the advancing wages that farmers are being forced to pay, it is evident that, even though machine trenching were to cost more than hand trenching, they probably would be forced to make use of the machine."

A summary of the costs of all tiling operations except hauling is given in the following table:

Installing costs per rod of tile drainage by hand and machine.

	Handwork, 1909.	Machine, 1910.	Machine, 1911.	Average machine.
Area in acres.....	40	65½	122½	-----
Number rods dug.....	2,560	4,080	4,755	-----
Machine charges.....		\$0.1084	\$0.1529	\$0.1324
Machine operator.....		.0315	.0392	.0356
Gasoline.....		.0219	.0305	.0266
Oil.....		.0014	.0028	.0022
Contract laying.....	\$0.3700	.0634	.0686	.0663
Filling ditches.....	.0300	.0252	.0363	.0312
Other equipment charges.....	.0040	.0037	.0043	.0040
Undivided operations.....		.0433	.0354	.0390
Overhead charges.....	.0230	.0230	.0340	.0230
Plotting drains.....	.0158	.0149	.0140	.0144
Total average cost.....	.4488	.3367	.4071	.3747

Report of the investigations on drain tile, American Society for Testing Materials (*Iowa Engin. Expt. Sta. Bul. 36 (1914), pp. 110, figs. 3*).—Tests of clay and concrete tile to determine the comparative values of results secured by the use of sand bearings, hydraulic bearings, and three-point bearings are

reported, the test specimens consisting of 100 each of 8-in., 16-in., and 24-in. tile of each material.

The general conclusions drawn are that the results of the tests by each of the types of bearings are consistent and concordant, and apparently reliable and truly indicative of the quality of the tile. The numerical results by the different bearings have fairly uniform ratios and can be calculated and reported in substantially the same unit by multiplying the breaking loads per lineal foot by the following factors: Sand bearings, 1; hydraulic bearings, 1.25; and three-point bearings, 1.5.

The sand bearings required from one to seven minutes more per test than the other bearings but are said to come much nearer to giving the real supporting strength of the tile in the ditch. The hydraulic bearings distributed the load very well along the tile to fit irregularities in shape and permitted rapid testing. The three-point bearings are considered the simplest and most convenient of all to use.

"There can not be nearly so wide a variation of the 'ordinary supporting strength' of drain tile in ditches, to carry the loads from the ditch filling as has heretofore been very generally assumed. . . . A comparison of the loads from ditch filling with the results of laboratory tests . . . indicates that the 'ordinary supporting strength' of drain tile in ditches is approximately equal to the breaking loads in tests with sand bearings." Additional tests of the same nature are reported which confirm the above conclusions.

A comparison of actually weighed values of loads on pipes in ditches from the weight of ditch filling with those computed from the formula $W_F = CwB^2$ shows a correspondence between the computed and weighed loads, thus closely checking the correctness of the formula. In this formula W_F = the load on a pipe in a ditch, in pounds per lineal foot, from the weight of ditch filling, C = the coefficient, taken from a proper table or diagram, of loads on pipes in ditches from ditch filling, w = weight of ditch filling material in pounds per cubic foot, and B = the breadth of the ditch, a little below the top of this pipe, in feet.

Investigations of factors of safety in actual tile drains and pipe sewers where the pipe have actually been observed to be sound resulted in the conclusion that with so-called "first class" pipe laying conditions, corresponding to the best pipe laying practice, and watched constantly by an inspector, it will be safe to use a nominal factor of safety of 1.25. For "ordinary" pipe laying conditions the factor of safety should be 1.5.

Other sections give data on the manufacture of the concrete tile tested and on the calculation of the modulus of rupture of the material of the tile shells.

The formulas resulting from the latter calculation are: $M = 0.20R \frac{W}{12}$, and $p = \frac{6M}{t^2}$, where M = the maximum bending moment in the tile shell, in inch-pounds per lineal inch, R = the radius of the center line of the tile shell, in inches, W = the "ordinary supporting strength" of the tile, in pounds per lineal foot, calculated by multiplying the breaking loads in strength tests by the factors noted above (five-eighths the weight of the tile per lineal foot for sand bearings, or three-fourths for hydraulic or three-point bearings, must be added to W in computing M whenever such addition exceeds 5 per cent of W), p = the modulus of rupture of the material of the tile shell, in pounds per square inch, and t = the average thickness of the tile shell, in inches, at the top or the bottom, whichever averages thinner.

Tile investigations, W. H. DAY (*Ann. Rpt. Ontario Agr. Col. and Expt. Farm*, 39 (1913), pp. 56-64, figs. 5).—Comparative tests of the breaking strength of 3 and 4-in. cement and clay tile showed that the average breaking strength

of the cement was 10 lbs. more than that of thin clay tile, and 333 lbs. less than average clay tile. It is concluded, however, that any of the clay or cement tile tested were strong enough to resist the earth pressure to which they would be subjected if placed in the ground. Further comparative tests of machine-made cement tile and clay tile led to the conclusion that cement tile, if properly made and cured, are as strong as some well-known and satisfactory makes of clay tile and strong enough for tile drainage purposes.

Tests of the immersion in air, immersion in vacuum, and specific gravity methods for determining the porosity of tile showed that the vacuum and specific gravity methods give almost identical results, which are both more than one-fifth higher than by immersion in free atmosphere. Using the immersion in vacuum method, it was found that the porosity of well-made cement tile was on the average considerably less than that of clay tile. It was also found that porosity of the tile wall was not the governing factor in permeability, this depending more on the glaze of the surface.

Tests of the permeability of cement and clay tile showed the clay tile, although more porous than the cement tile, to be usually less permeable. The cement tile, however, showed considerable difference of behavior which depended on the wetness of the mortar, it being found that if the mortar was wet enough so that the packer produced a smooth watery surface on the entire inner surface the tile wall was practically water-tight.

Proportioning aggregates for Portland cement concrete, A. MOYER (*Reprint from Amer. Soc. Testing Materials Proc.*, 14 (1914), pp. 12).—This paper describes various methods of carrying on investigations so that with a given sand and a given stone or gravel, proportions can be stated by the engineer which will make a concrete of maximum density and maximum strength. Investigation showed that arbitrary specifications without previous knowledge of the character of the aggregates are likely to be wrong.

It is concluded that it takes 110 lbs. of Portland cement to make 1 cu. ft. of paste in opposition to the usual assumption of 94 lbs. per cubic foot. The author further concludes that instead of the old plan of filling the voids with sand and cement these voids must necessarily be filled with paste (cement and water), and that the study of the proportioning of aggregates must be based on the proper proportions of cement, water, and sand to make a sufficiently rich mortar to bind together the larger aggregates.

For the purpose of economy it is stated that various sizes of stone should be used and an investigation made to determine which size will produce the least percentage of voids so that less mortar may be used and more strength obtained.

Specifications for sand for concrete, E. McCULLOUGH (*Cement Era*, 12 (1914), No. 10, p. 56, fig. 1).—The author "as a result of many hundred granulometric analyses of concrete sand proposes the following specification as suitable for general use and which will not bar out any good sand to be found on the market:

"The sand may be any suitable material of a quality at least equal to the quality of the stone or gravel used in the concrete and shall range in size from fine to coarse. It shall all pass through a $\frac{1}{4}$ -in. mesh; not to exceed 80 per cent shall pass through a 20 mesh; not to exceed 50 per cent shall pass through a 50 mesh; and not to exceed 20 per cent shall pass through an 80 mesh."

[**Land clearing**], J. H. GRIDALE (*Canada Expt. Farms Rpts.* 1913, pp. 26-28).—Twenty acres of land covered with heavy timber were cleared under provincial conditions for the plow at an average cost of \$506 per acre. The windfalls, trees left by loggers, and brush were cleared away before attacking the standing timber.

Fifty-eight acres were cleared under contract, the following comparisons being made: Twenty acres of swampy ground were cleared with a 40-horsepower donkey engine at a total average cost of \$398 per acre. Twenty acres with no swamp were cleared by "a practical man with a good crew and teams" at a cost of \$338 per acre. The total cost per acre of clearing seven acres of similar land which had previously been slashed was \$246, and of seven acres previously cleared of brush by a forest fire \$189. Four similar acres were cleared by a crew, stump puller, and team at a cost of \$212 per acre.

Two trials of the charpit system were unsuccessful, owing to heavy rainfall. Two tests, made on two large stumps standing side by side to see whether, by running a cable from each to a 7-ft. stump and tightening it by wedges, the side tension would help in pulling the stump clear of the ground when blown up, were unsuccessful.

Stump burning to reclaim logged-off lands, LE R. W. ALLISON (*Engin. Rec.*, 70 (1914), No. 4, pp. 95, 96, fig. 1).—Methods and costs of clearing tracts of fir and pine stumps for agriculture in the Pacific Northwest are given. The burning out of the roots by charpitting is said to be the most favored method. A plant for this purpose is described, which consists of a gasoline engine, a 5-fire stump burner, a cordwood saw, a power grubber, a geared horse stump puller, and a power stump puller.

Annual report of the state highway department (*Ann. Rpt. State Highway Dept. Ohio*, 8 (1912), pp. 276, figs. 136).—This includes the reports of the bureaus of construction, maintenance and repair, and bridges, and of the state testing laboratory. A number of plans and illustrations accompany these reports.

In a report on the road materials of Ohio, sedimentary rocks are said to predominate and are represented by the following varieties: Shale, sandstone, limestone, dolomite (dolomitic or magnesian limestone), conglomerate, underclay, fire clay, chert or flint, coal, iron ore, clay, sand, and gravel.

Additional rules and regulations governing state road work for year 1913 (*State Highway Com. Minn. Bul.* 10 (1913), pp. 8, pls. 6).—Detailed plans and working data for plain and reinforced highway culverts are given.

Standard culvert designs (*Cement Era*, 12 (1914), No. 10, pp. 51-53, 63, figs. 13).—Standard plans, together with quantities of material and reinforcing, are given for different sizes of circular concrete culverts as designed by the Iowa Highway Commission.

Some tests on a Diesel engine, W. S. BURNS (*Gas Engine*, 16 (1914), No. 10, pp. 615-621, figs. 11).—Tests on the effect of (1) variation of blast pressure and (2) variation of jacket water temperature upon the running of a Diesel engine are described and the results reported graphically.

It was found that at all loads too low a blast pressure pulverizes the oil imperfectly, causing late ignition and incomplete combustion with increase of exhaust pressure and temperature above normal, while too high blast pressure causes late but violent ignition attended again by incomplete combustion of the oil. At all loads an increase of jacket water temperature did not seem to affect the point of ignition of the oil appreciably, but caused more rapid and more complete combustion with increased efficiency.

A rating chart for centrifugal pumps, L. J. BRADFORD (*Engin. News*, 72 (1914), No. 8, pp. 382-384, figs. 4).—A graphical rating table is given to facilitate the selection of pumps when the speed, head, and capacity are given.

The present status of mechanical cultivation in Europe, F. LEDEBOER (*Meded. Proefstat. Java-Suikerindus.*, 4 (1914), No. 25, pp. 491-520, pls. 23; *Arch. Suikerindus, Nederland. Indië*, 22 (1914), No. 19, pp. 689-718, pls. 22).—A large number of mechanical cultivating machines, grouped under the two

types, tractors and cable systems, are described and illustrated and their methods of operation discussed.

Preliminary tests of new dairy machinery, B. MARTINY (*Arb. Deut. Landw. Gesell.*, No. 259 (1914), pp. 69, figs. 18).—A large number of different dairy implements are described and illustrated, and preliminary tests of the systems as to the manner and efficiency of their operation are reported.

The distribution of the overhead electrical discharge employed in recent agricultural experiments, I. JÖRGENSEN and J. H. PRIESTLEY (*Jour. Agr. Sci. [England]*, 6 (1914), No. 3, pp. 337-348, figs. 8).—In studies of conditions requiring certain modifications in the methods to be employed in subsequent field experiments it was found that the strength of the discharge from an overhead wire network at a high potential is a variable quantity depending on the mobility of the carriers of the electricity and on the velocity of the wind.

Measurements of potential gradient and of current density agreed in showing that the effect of the discharge is not limited to the area under the wires, which is of importance owing to the fact that control and electrified areas have usually been placed close together in field experiments. In this connection an account is given of the distribution of the discharge under various weather conditions. Methods are discussed by which the control area may be kept under more normal electrical conditions in spite of the proximity of the overhead discharge wires, and the results of more or less unsuccessful experiments in this direction in which a plat was entirely inclosed by a wire cage of $\frac{1}{2}$ -in. mesh netting 6 ft. high are discussed.

Farm storages for fruits and vegetables, E. SMITH (*Brit. Columbia Dept. Agr. Bul.* 58 (1914), pp. 27, figs. 18).—This bulletin deals with storages for fruits and vegetables.

The two main types dealt with are those using some means of lowering the temperature below that of the outside air and those depending upon temperatures secured from atmospheric changes. The first class is subdivided into those using mechanical refrigeration and those using ice as a refrigerant. The desirable points taken from many designs investigated are summarized in diagrammatic illustrations which are intended for complete and modern cold storage and packing houses.

It is stated that with a basement storage better ventilation is had by placing the building at right angles to the prevailing winds, and if the storage is above ground the building should run north and south. For vegetable storage the cheapest equipment to supply is said to be the pit or trench, in which may be stored such crops as the potato, cabbage, celery, carrot, beet, and other root crops. Good drainage is essential for a storage pit of this kind, and this may usually be found on a slope having a loose or gravelly subsoil.

Bills of material are given for different types of storage structures and special information is given for storage houses for celery and onions.

The geology of the county of Jervois, and of portions of the counties of Buxton and York, with special reference to underground water supplies, R. L. JACK (*Geol. Survey So. Aust. Bul.* 3 (1914), pp. 47, pls. 6, figs. 4).—This report describes and discusses the topography and geology of the county of Jervois and portions of the county of York, with special reference to the occurrence and distribution of surface and underground water supplies. A geological chart of the area is appended.

Lowering of the ground-water table, W. A. COOK (*Trans. Kans. Acad. Sci.*, 26 (1913), pp. 84-86).—The drying up of creeks, ponds, rivers, surface springs, and wells in eastern Kansas is attributed by the author to the lowering of the ground-water table in that part of the State. It is stated that stockmen, farm-

ers, and municipalities should seek a water supply well below the present water table.

"Witching" for water and other things, J. T. LOVEWELL (*Trans. Kans. Acad. Sci.*, 26 (1913), pp. 101-103).—The author concludes "that all the claims of water witches are delusions unworthy scientific consideration."

Analyses of private water supplies, H. E. BARNARD, J. A. CRAVEN, and J. C. DIGGS (*Ind. Bd. Health, Ann. Rpt. Chem. Div.*, 8 (1913), pp. 297-333, figs. 22).—Analyses of a large number of private water supplies from wells, springs, and cisterns show that the deep well waters were in most instances of good quality. The shallow-dug well waters were in nearly all cases bad or doubtful, as were also the majority of the cistern and spring waters examined. A number of photographs of bad conditions existing in the immediate vicinity of wells, springs, and cisterns are included.

The water supply of farm homesteads, F. T. SHUTT (*Canada Expt. Farms Rpts.* 1913, pp. 225, 268-275).—Of 188 samples of water from various parts of the Dominion submitted to complete sanitary analysis 89 were pure and wholesome, 43 suspicious and probably dangerous, 41 severely contaminated, and 15 too saline to be used as a potable supply. The worst waters were from shallow wells dug in barnyards or in the neighborhood of similar sources of pollution.

Illuminating power of kerosenes, W. KUNERTH (*Iowa Engin. Expt. Sta. Bul.* 37 (1914), pp. 29, figs. 6).—A series of experiments conducted to determine the quality of kerosene oils used in the State of Iowa and the relations existing between the illuminating power of a kerosene oil and some of its physical properties are reported. Sixty-one samples of kerosene were tested.

By the application of ordinary photometric methods great differences in the illuminating power of different samples of kerosene oils were shown. Oils having a high illuminating power were found also to be high in density, index of refraction, viscosity, surface tension, flash point, and burn point. With these oils the length of wick charred was shorter and the fogging of the chimney was more marked than for the oils of low illuminating power.

Putting coloring matter into the oil and exposing it to light and draft reduced the illuminating power. The denser the oil the greater was the intrinsic brilliancy of the flame, and the lighter the oil the more nearly white was the flame.

It was further shown that the oils used in Iowa have practically the same burning quality, that oils from the East have a lower density and are sold at a higher price, and that oils which were retailed at a lower price gave the most light.

It is concluded in connection with these tests that kerosene oil lamps are not very desirable as standards of comparison.

RURAL ECONOMICS.

What the farm contributes directly to the farmer's living, W. C. FUNK (*U. S. Dept. Agr., Farmers' Bul.* 635 (1914), pp. 21, figs. 2).—This contains the result of a study to determine the value of that part of the farmer's living which is furnished directly by the farm. The practice was to drive along a road in the district selected and visit every farmhouse, the aim being to obtain a true average for the conditions of that community. The regions studied include counties in North Carolina, Georgia, Texas, Kansas, Iowa, Wisconsin, Ohio, Pennsylvania, New York, and Vermont, and deal with 483 farmers having an average of 4.6 persons to a family.

It was found that the average annual value of food, fuel, and use of a dwelling as furnished by the farm were \$421.17 per family, \$261.35 being for food, \$34.72 for fuel, and \$125.10 for house rent. The average value of the food,

coal, wood, and oil bought per family was \$173.91, of which \$150.75 was for food, \$14.79 for coal, \$2.63 for wood, and \$5.74 for oil. Of the food consumed per family 63 per cent was furnished by the farm, of the groceries 5.6 per cent, of the animal products 83.5 per cent, of the fruits 66.6 per cent, and of the vegetables 78.2 per cent. The average annual value of the use of the farmhouse was found to be \$125 per family.

The author concludes that "the result of these studies shows that the farmer's cost of living in actual cash expenditures is very materially reduced by what the farm furnishes in food products, fuel, and house rent; in fact, the income from this source adds as much to the real wealth of many farmers as does the net income from the sale of farm products."

A large number of tables are included showing the variations in the different States studied, and details for the various items included under the general classes mentioned above.

The work of rural organization, T. N. CARVER (*Jour. Polit. Econ.*, 22 (1914), No. 9, pp. 821-844).—The author points out that after an agricultural region has once become settled, with all the land in cultivation and with enough labor employed on it to cultivate it somewhere beyond the point of diminishing returns, it must limit its birth rate and keep the population stationary; increase the intensity of its cultivation, getting continually smaller production per man, though increasing the production per acre; or force its surplus rural population to migrate either to new agricultural regions or to cities. He also points out that if prices fall not only must the farmer reduce his yields per acre, but his acreage if he would avoid bankruptcy.

With the improved methods of farming, a farmer has greater need of capital and, therefore, of credit, but credit should be employed only where it gives the greatest productive advantage. When it comes to the work of growing farm crops as distinct from selling them and buying the raw material, the one-family farm is the most effective unit but to buy or sell effectively the large producer has an advantage, and individual farmers should unite to obtain the same advantage. The principal lines of work along which farmers should organize are the growing of farm products, purchasing farm supplies, securing adequate credit, and improving the means of communication and transportation. To make the farmers' living conditions better an improvement in the education, sanitation, recreation, and beautification in rural districts is necessary.

Unifying rural community interests, edited by H. ISRAEL (*New York and London, 1914*, pp. 125).—This book contains a series of addresses on the following subjects: The Department of Agriculture and Country Life and The United States Rural Organization Service, by T. N. Carver; The Point of Emphasis in the New Rural School Idea, by A. C. Monahan; The Country Church and the Young Men's Christian Association, by G. W. Fiske; and The Place of the Young Men's Christian Association in the New Rural Awakening, by K. L. Butterfield.

Bibliography of rural sociology (*N. H. Col. Agr. and Mech. Arts, Bibliogr. Rural Sociol.*, 1914, pp. 8).—This pamphlet contains a brief, annotated bibliography.

Proceedings of the seventeenth conference for education in the South (*Proc. Conf. Ed. South*, 17 (1914), pp. 386, pl. 1, fig. 1).—This conference has been noted editorially (*E. S. R.*, 30, p. 608).

Syllabus of home-study club studies (*Univ. N. C. Rec.*, No. 121 (1914), pp. 43).—This syllabus outlines a method for the home study of conditions within a county by means of a series of questions, and points out how to obtain answers to the questions. Among the topics outlined are natural resources, popu-

lation, wealth studies especially from farm products, rural credits, markets, highways, schools, public health, the church, and the farm home.

Cooperative institutions among the farmers of Catawba County (*Univ. N. C. Rec.*, No. 119 (1914), pp. 15).—This pamphlet tells how a cooperative creamery, a sweet potato growers' association, a farmers' union warehouse company, and a rural credit association were organized.

The influence of social position of members of cooperative societies upon their activities in relation to agricultural saving and loan banks, J. ZIMMER (*Landw. Jahrb.*, 46 (1914), No. 3, pp. 431-454, figs. 2).—The author calls attention to the organization of cooperative societies and banks, the methods of creating working capital, and the employment of the capital as the system is influenced by social status of the members of the society, i. e., as to whether they belong to the agricultural, industrial, or commercial classes.

Cooperative credit (*Bul. Russell Sage Foundation Libr.*, No. 5 (1914), pp. 7).—This pamphlet contains an annotated bibliography on cooperative credit.

Newark Horsekeepers' Insurance Company, Limited (*Jour. Ed. Agr.* [London], 21 (1914), No. 7, pp. 644-652).—In this company the horses insured are revalued each year in December, and the amount of the valuation determines for the next 12 months the amount payable on any claim regarding the horse. In case of loss the company pays only two-thirds of the market value. The rate of insurance charge is approximately 5½ per cent per annum of the market value, and this also entitles the insurer to attendance and medicine by a veterinarian employed by the company.

Economic history [of agriculture] in Russia, J. MAVOR (*In An Economic History of Russia. London, Toronto, and New York, 1914, vol. 1, pp. 185-430; rev. in Scot. Geogr. Mag.*, 30 (1914), No. 10, pp. 518-527).—These chapters are devoted to a discussion of the Russian agricultural peasant and describe the various types found, with a history of the movement from the beginning of the eighteenth century to date.

The agricultural labor conditions in Russia, S. BLANK (*Die Landarbeiterverhältnisse in Russland seit der Bauernbefreiung. Zurich and Leipsic, 1913, pp. 226, pl. 1, figs. 3*).—This book discusses the economic status of the Russian peasantry, the various types of agricultural laborers, their wages, living conditions, and the attitude of the government toward them.

Slavs on southern farms, L. HODGES (*U. S. Senate, 63. Cong., 2. Sess., Doc. 595 (1914), pp. 21*).—The author describes the success of the Poles and Bohemians as farmers in Texas, Arkansas, and Virginia. He declares that they have made good as farmers in communities where the native Americans are scarcely able to maintain themselves, and that they have been found to be thrifty, industrious, and thoroughly honest in all their business and social relations.

The agrarian revolution in Georgia, 1865-1912, R. P. BROOKS (*Bul. Univ. Wis.*, No. 639 (1914), pp. 129, figs. 5).—The author traces the history of the negro as a farm laborer and share tenant. He concludes that it is the escaping from supervision, and not the larger opportunity for profits, that the negro has in mind in shifting from the position of wage earner or share tenant to renter.

The history of the normal negro agricultural laborer is stated as follows: He begins as a youth working for wages. As soon as he has a family that can be utilized for field work he becomes a share tenant. Under the semicompulsion of this system he makes good profits, and, if he has any capacity for saving, can in a short time buy a mule and a few tools and set up as a renter. So great has been the competition for laborers and so completely have the negroes had the upper hand in this matter, that negro wage earners and share tenants have in many instances been able to achieve an independent position even

without the inconvenience of having to save the small amount necessary to stock a renter's farm.

The author also calls attention to the variations from this process under the different geographic and economic conditions found in Georgia.

Penal farms and farm colonies (*Bul. Russell Sage Foundation Libr., No. 6 (1914), pp. 4*).—This bulletin contains a brief, annotated bibliography.

[**Statistical record of agricultural progress in the United States**] (*U. S. Dept. Com., Statis. Abs. U. S., 36 (1913), pp. 120-181, 229-240*).—Contained in this annual statement are statistical data showing for the United States the number of acres in farms, the area of improved and unimproved land for 1890, 1900 and 1910 by States, the area, production, and value of the principal farm crops by States for 1912-13, and for the United States as a whole for 1860-1913, the number of live stock for the United States as a whole, 1889-1913, the quantity of animal products manufactured for the census years 1850 to date and of forestry products for 1908-1913, inclusive, and the number of persons employed in specified gainful occupations for 1910.

Field agent's handbook of agricultural statistics (*U. S. Dept. Agr., Field Agent's Handb. Agr. Statis., 1914, pp. 116*).—This handbook, intended for ready reference, contains in condensed form statistics of the important classes of agricultural products for the United States and for each State, showing the acreage and value of the principal farm crops, number and value of animals sold or slaughtered, and quantity and value of animal products sold.

The agricultural outlook (*U. S. Dept. Agr., Farmers' Bul. 641 (1914), pp. 1-9, 23-40, fig. 1*).—This report gives the usual information regarding the estimated average yield per acre, total production, quantity, and price of the principal farm products, including comments on the preliminary estimates of several crops by F. Andrews and the world's wheat outlook by C. M. Daugherty. Statistical data are also given showing the hops consumption and movement in the United States for 1906-1914. This data indicates that the total consumption by brewers and exports amounted to 68,280,743 lbs. in the fiscal year ended June 30, 1914, of which 5,382,025 lbs. were imported.

Preliminary reports are also included as given by the International Institute of Agriculture concerning the production of specified crops in specified countries and from the Government of Canada concerning the production of farm crops for 1914.

Statistical tables showing the condition, yield per acre, production, quality, price, weight of grain per measured bushel, and stocks on farms of specified crops, by States, and other data are appended.

Range of prices for butter and eggs in the Chicago market together with the receipts, also prices for refrigerator eggs (*Chicago, 1914, pp. 16*).—This contains data as to the monthly receipts at the Chicago market of butter and eggs for the past 10 years, the monthly prices for the past 20 years, and a classification of the various grades of butter and eggs.

Wholesale prices, Canada, 1913, R. H. Coats (*Canada Dept. Labor, Wholesale Prices, Canada, 1913, pp. XVII+288, figs. 22*).—This report shows the wholesale prices by months, beginning with 1890, for practically all the products of the farm.

[**Management of the Central Experimental Farm, Ottawa, Canada**] (*Canada Expt. Farms Rpts. 1913, pp. 32, 33, 113-122, pl. 1*).—This report gives a statement of the crop returns on the Central Experimental Farm for 1912 together with the value per unit for the different items of cost as well as the products obtained. The statement also includes the rotations followed and the yields. These details are shown by means of statistical tables.

Occupations and industries (*Census of England and Wales, 10 (1911), pts. 1, pp. CLI+867; 2, pp. VIII+781*).—These volumes of the census give the number of persons engaged in agriculture and other occupations by sex, age, marital conditions, and position held, for England and Wales as a whole and by minor geographic divisions. It was found that the number of males and females employed in agriculture formed a decreasing proportion of the total population as indicated in the following table.

Number of persons engaged in agriculture in England and Wales, 1851–1911, and the proportion of the total population.

Census year.	Males aged 10 years and upward engaged in agriculture.	Proportion of total males aged 10 and upward.	Females aged 10 years and upward engaged in agriculture.	Proportion of total females aged 10 and upward.
		<i>Per cent.</i>		<i>Per cent.</i>
1851.....	1,544,087	23.5	168,652	2.4
1861.....	1,539,965	21.2	115,213	1.5
1871.....	1,371,304	16.8	85,667	1.0
1881.....	1,288,173	13.8	64,216	.6
1891.....	1,233,936	11.6	51,045	.4
1901.....	1,153,185	9.5	38,782	.3
1911.....	1,253,859	9.2	37,969	.3

The number employed in agriculture, the total acreage under crops and grass, and the number of the different kinds of live stock have remained practically the same during the last 30 years.

Statistical abstract for the British Empire in each year from 1898–1912 (*Statist. Abs. Brit. Empire, 10 (1898–1912), pp. 241–290*).—Contained in this report are statistical data showing the production and consumption of the principal agricultural products in the United Kingdom and its various colonies and possessions for 1912, with comparative data for earlier years.

Statistical abstract for the principal and other foreign countries in each year from 1901–1912 (*Statist. Abs. Prin. and Other For. Countries [Gt. Brit.], 29 (1901–1912), pp. 358–380, 466–472*).—This report contains statistical data showing the total arable or cultivated land, the acreage and production of the principal farm crops, and the number of live stock for as many countries as information is available. It shows the quantity of beets used by sugar factories, the sugar produced, and the quantity imported, exported, and consumed.

Statistics of harvest in Austria, 1913 (*Statist. Jahrb. K. K. Ackerb. Min. [Austria], 1913, pp. VI+360*).—This yearbook gives the area devoted to various agricultural purposes, the area in crops, and the average and total yields by minor geographic divisions.

Agricultural statistics of Italy (*Ann. Statist. Ital., 2. ser., 3 (1913), pp. 130–144*).—This portion of the annual statistics of Italy shows the area devoted to the different agricultural purposes by Provinces and the total areas and production of the principal crops for 1913, with comparative data for earlier years.

AGRICULTURAL EDUCATION.

The training of women in the state colleges, MARGARET B. MACDONALD (*Rural Educator, 4 (1914), No. 3, pp. 50, 51*).—Attention is called to the opportunities for women to study agriculture and home economics at the state agricultural colleges.

Teachers' extension schools, G. A. BRICKER (*Rural Educator*, 4 (1914), No. 1, pp. 6-9, figs. 2).—This article has been previously noted (*E. S. R.*, 27, p. 195) with the exception of an added scheme for the establishment of a system of teachers' extension schools, taking the county as a unit, in any State.

Agriculture in the high school and community service, G. A. WORKS (*Bul. Univ. Wis.*, No. 591 [1913], pp. 70-73, fig. 1).—In this paper, presented at the third annual Wisconsin Country Life Conference in January, 1913, the author suggests opportunities for community service by the high schools giving instruction in agriculture.

Rural schools linked up with home and farm, ELLEN B. McDONALD (*Bul. Univ. Wis.*, No. 591 [1913], pp. 73-81, fig. 1).—In this paper, presented at the third annual Wisconsin Country Life Conference in January, 1913, the author points out opportunities in country schools for practical work related to the farm and the home in civics and history, arithmetic, language, hygiene, geography, agriculture, boys' and girls' farm contests, harvest festivals in schoolhouses, sewing, and industrial work.

Agriculture in the Idaho Falls high school, B. R. CRANDALL (*Amer. School Bd. Jour.*, 49 (1914), No. 4, pp. 17, 18, figs. 4).—A description is given of the 4-year agricultural course, which is cultural as well as vocational. A short winter course in English, farm accounting, general agriculture, irrigation farming, dairying, and farm repairs is also offered for boys unable to take the longer course.

Boys' and girls' demonstration work in the Southern States, O. B. MARTIN (*Proc. Conf. Ed. South and Ann. Meeting South. Ed. Assoc.*, 1914, pp. 57-62).—This is a review, including the best individual and collective records, of the girls' canning club and boys' corn club work in the Southern States in 1913.

School gardens (*Atlantic Ed. Jour.*, 10 (1914), No. 1, pp. 26-30).—A survey of experiments in community work among school children that are being tried in various sections of the country.

Gardening in public schools, H. P. WILLIAMS (*Breeder's Gaz.*, 66 (1914), No. 6, pp. 187, 188, figs. 4).—General notes on boys' and girls' club work are followed by an account of the school garden work in Cook County, Ill., by E. J. Tobin and S. Shepard.

The Portland school gardens, M. O. EVANS, JR. (*Amer. School Bd. Jour.*, 49 (1914), No. 1, pp. 36, 37, figs. 2).—A brief description is given of the 43 school gardens in Portland, Oreg., covering a total area of approximately 16 acres. A total of 10,600 children are participating in school and home gardens, or 39 per cent of the total public school enrollment.

[Instruction in agriculture and home economics in Alaska] (*U. S. Bur. Ed. Bul.*, No. 36 (1913), pp. 19-30).—Reports by teachers in the public schools under the control of the Federal Government include notes on instruction in agriculture, cooking, sewing, and laundering.

The folk high schools of Denmark, L. L. FRIEND (*U. S. Bur. Ed. Bul.* 5 (1914), pp. 24+III, pls. 4).—The author gives a brief historical sketch and describes the organization and work of the folk high schools of Denmark, points out what they have accomplished for Denmark, and offers suggestions as to the possible application of the folk high school idea in the mountain and Piedmont sections of the South in this country. As in Denmark, the special mission of such schools would be to offer short winter courses to young men and women between the ages of 16 and 25 or 18 and 30, to awaken their intellectual life and give them technical instruction in the pursuits of rural life. A suggested program for a course for young men, covering three winter terms of five months each, is outlined.

The Danish folk high schools, H. W. FOGHT (*U. S. Bur. Ed. Bul. 22 (1914)*, pp. 93+IV, pls. 6).—In this bulletin, which is an amplification of that previously noted (*E. S. R.*, 31, p. 598), the author discusses recent agricultural evolution, the evolution of the folk high school in Denmark, how the school is organized and administered, and the subject-matter and its presentation. He also describes some typical folk high schools, local agricultural schools and their work, special agricultural schools for small holders, rural schools of household economics, and the folk high school transplanted to other countries. In discussing the feasibility of adapting the folk high schools to American conditions he considers the need of agricultural reorganization in this country, the inability of the old rural schools to cope with the situation, the coming of the centralized farmers' schools, how the reorganized schools may profit by the Danish system, why there is need of schools for grown-ups in the United States, the South Atlantic Highlands as a good place to begin, the "moonlight" schools of Kentucky, how the schools which should receive all who are not now looked after by the public schools might be organized, and schools in which to train the teachers.

Agricultural education in the State of Victoria, Australia, E. HANDLEY (*Rural Educator*, 4 (1914), No. 1, pp. 17, 16).—A topical outline of the course in agriculture in the third and fourth years in the agricultural high schools.

[Nature study and elementary agriculture for the New York public schools] (*Cornell Rural School Leaflet*, 8 (1914), No. 1, pp. 276, pl. 1, figs. 46).—This consists of two parts, as follows: (1) Subject matter of help in teaching nature study and elementary agriculture as outlined in the New York state syllabus for 1914-15, comprising articles by specialists on birds, animals, plants, insects, and trees; and (2) suggestive material for rural teachers especially interested in out-door study, including several special articles and rural teachers' reports on the teaching of nature study and elementary agriculture.

Nature study and agriculture course for use in the public schools of New Brunswick, R. P. STEEVES (*Fredericton, New Brunswick: Bd. Ed.*, 1914, pp. 32).—This contains a syllabus of a course of instruction in nature study and agriculture for grades 1 to 8, inclusive, approved by the board of education April 23, 1914; suggestions on methods of teaching; subject-matter classified under the headings of plants, animals, physical nature, and environment, and arranged by months for each of the first five grades; a list of books recommended as helpful in teaching nature study and agriculture; and the board's regulations governing the instruction in elementary agriculture with school gardening.

Agricultural education (*Dept. Agr. New Brunswick Bul. 2 (1914)*, pp. 13, figs. 4).—Suggestions to teachers concerning subject-matter in agriculture and school gardening for the months of January to June, inclusive, and methods of teaching these subjects.

[Agricultural instruction for the teachers of Porto Rico] (*Agr. Col. Weekly [P. R.]*, 2 (1914), Nos. 71, pp. 353-356; 72, pp. 357-362, figs. 3; 73, pp. 363-366; 74, pp. 367-370; 75, pp. 371-376; 76, pp. 377-380; 77, pp. 381-384; 78, pp. 385-388; 79, pp. 389-393; figs. 3; 80, pp. 394-399).—These bulletins consist of studies of poultry growing in the Tropics, the pruning of trees, coffee growing, physics as a practical study, ginger and its cultivation, diversified farming, coconut culture, patterns and models, and some problems in feeding poultry.

The natural history of the farm, J. G. NEEDHAM (*Ithaca, N. Y.*, 1913, pp. 348, figs. 140).—This book on the sources of agriculture offers a series of studies for the entire year, each dealing with a different phase of life on the farm and each made pedagogically practical by a definite program of work. A definite form of record is suggested for each practical exercise illustrating field work methods. Individual exercises which the student may pursue independently, as

well as a chapter on the production and preservation of wild nature, are included.

A suggestive outline for work in the study of soils, L. G. ATHERTON (*Normal Teacher* [Madison, S. Dak.], 3 (1913), No. 2, pp. 9).—Practical exercises in soil study, together with suggestions for carrying them out in rural schools, are given.

Dry farming in Oregon, H. D. SCUDDER (*New York*, 1914, pp. 19, figs. 7).—This supplement to Warren's Elements of Agriculture (E. S. R., 21, p. 494) is a study of dry farming conditions, special tillage practices, machinery, crops, and farm management in Oregon.

Demonstration work for agricultural high schools, J. T. WEST (*Miss. Agr. Student*, 2 (1914), No. 2, pp. 6, 5).—Methods for planting agricultural high school demonstration plats in a three-year rotation are outlined.

Corn, M. J. ABBEY (*W. Va. School Agr.*, 5 (1914), No. 1, pp. 18, figs. 8).—In this series of field and classroom lessons on corn the facts are developed largely through the pupils' own activity, the teacher being merely the guide to the information. Suggestions on how to correlate the study of corn with other school subjects are given.

The home vegetable garden (*Cornell Rural School Leaflet*, 7 (1914), No. 4, pp. 293-301, figs. 5).—A complete vegetable garden plan is outlined as a guide for older boys and girls, together with a few general rules for gardening.

Transplanting, R. T. NEAL (*Hampton Leaflets*, 1 (1914), No. 3, pp. 12, figs. 6).—The author gives reasons and instructions for transplanting plants.

Fall work with apples, M. J. ABBEY (*W. Va. School Agr.*, 5 (1914), No. 2, pp. 16, figs. 9).—The author sets forth some of the elementary principles of apple culture and outlines exercises indicating how this subject-matter may be taught by demonstrations, trips to the orchard, and inquiries by the pupils.

Farm animals, T. F. HUNT and C. W. BURKETT (*New York and London*, 1914, pp. IX+534, pl. 1, figs. 469).—In preparing this book, which is intended for pupils between the ages of 14 and 18 years, the authors have sought to cover the whole field of animal industry. They have assumed that the subject matter will occupy 16 full weeks of three recitations each, and that two days each week would be devoted to practicums or one day to practicums and one to a review. Each lesson contains a note to the teacher and 15 paragraphs in which are developed the ideas or set of ideas discussed in the lesson text.

Horses (*Cornell Rural School Leaflet*, 8 (1914), No. 1, pp. 73-92, figs. 14).—Brief suggestions are given by Alice G. McCloskey and E. M. Tuttle on methods of teaching lessons on horses, followed by lessons by M. W. Harper on the characteristics and types of horses, estimating age, harness and harnessing, and training, and a score card.

How to teach a lesson on the dairy cow, G. A. BRICKER (*Rural Educator*, 4 (1914), No. 3, pp. 48, 49, figs. 4).—The author considers the fundamental differences in dairy cows for one recitation, and the breeding and selection of cows for certain purposes and the naming and locating of the principal parts of the cow's body for a second recitation. A cloth wall diagram of a dairy cow is illustrated.

Principles of bookkeeping and farm accounts, J. A. BEXELL and F. G. NICHOLS (*New York, Cincinnati, and Chicago*, 1914, pp. 104).—This is a teacher's reference book to accompany the author's Principles of Bookkeeping and Farm Accounts, previously noted (E. S. R., 29, p. 792). It suggests methods of instruction and contains model entries of transactions illustrating principles taught in the various lessons.

The subject matter in home economics courses for high schools: Factors determining the choice of subject matter in a laboratory course in foods,

JESSAMINE C. WILLIAMS (*Manual Training and Vocational Ed.*, 16 (1914), No. 2, pp. 74-81).—The subject matter of a laboratory course in foods is considered from the points of view of the pupil, her environment, and the school.

Home economics in village and rural schools, FRANCES L. BROWN (*Agr. Ed. [Kans. Agr. Col.]*, 6 (1914), No. 7, pp. 24, figs. 4).—The author discusses the importance of training for the home and plans for cooking, sewing, lunches, and girls' clubs in village and rural schools, including equipment.

Domestic economy in the schools (*Bul. Univ. Texas*, No. 326 (1914), pp. 69, pls. 4).—This bulletin, edited by the Texas Home Economics Association, contains suggested equipment and cost data for a domestic economy laboratory and domestic art room and syllabi of domestic economy for elementary and secondary schools of Texas. This is the first step of the association, organized in 1913, in its endeavor to place the course of study in domestic economy throughout the State on a uniform basis, raising the general standard of the work, and obtaining for it the same credit and recognition accorded to other subjects in the curriculum.

[A course designed for instruction in food and cookery], HELEN M. SPRING (*Philadelphia: Drexel Inst.*, 1914, cards 43).—Each of these cards covers a special phase of food or cookery. They are designed for laboratory use.

The busy housewife, ANTONIE STEIMANN (*Die tüchtige Hausfrau. Stuttgart and Vienna*, 1913, vols. 1, pp. XVI+747, pls. 17, figs. 1443; 2, pp. VI+595, pls. 18, figs. 161, sup. pp. 7, pls. 6).—The first of these volumes has to do with household labor of different sorts, clothing and garment making, sewing, embroidery, needlework, and similar topics, a series of patterns being appended. The second has to do with food and its preparation, and has a supplement on The Pig and its Use as Food, containing a number of plates showing the method of cutting up pork, together with descriptive text.

[Home economics instruction], MARY E. FRAYSER (*Winthrop Normal and Indus. Col. S. C. Bul.*, 7 (1913), No. 1, pts. 1, pp. 22; 2, pp. 44; 7 (1914), Nos. 3, pt. 2, pp. 36, figs. 9; 4, pt. 2, pp. 40, figs. 10).—These bulletins treat respectively of a plan for organizing and operating homekeepers' clubs in South Carolina, women's club programs in home economics, the care and feeding of children, and fireless cooking.

School gardens, R. P. STEEVES (*Dept. Agr. New Brunswick Bul.* 1 [1914], pp. 7).—Suggestions for practical work in gardening during the fall term are given.

School and home gardening for use in primary grades ([*Philippine*] *Bur. Ed. Bul.* 31, rev. (1913), pp. 115, figs. 75).—This bulletin outlines work in gardening for the elementary schools of the Philippine Islands, in which it is a required and accredited subject. The preparing, planting, care, and products of the school and home garden, school ground improvement, the teacher's home garden, the garden during vacation, etc., are discussed, and suggestions offered for classroom lessons.

The 1914 corn campaign ([*Philippine*] *Bur. Ed. Circ.* 46, s. (1914), pp. 24).—This is a revision of Circular 80, previously noted (*E. S. R.*, 30, p. 395).

Arbor Day in California, 1914 (*Sacramento: State Supt. Pub. Instr.*, 1914, pp. 24).—This contains nature poems and songs; articles on Arbor Day, by Theodore Roosevelt; Birds and Their Relation to Agriculture, by Mrs. Ethel Bloodgood, and California Trees; outlines for compositions, declamations, etc.; facts about birds and trees; program suggestions, etc.

Arbor Day observance, 1914, R. P. STEEVES (*Dept. Agr. New Brunswick Circ.* 1 (1914), pp. 4).—Suggestions are offered to teachers and others to encourage the improvement of rural school grounds as an observance of Arbor Day.

Arbor Day (*Hawaii Ed. Rev.*, 2 (1914), No. 8, pp. 12, 13).—This article gives directions for the treatment of plants when received from the nursery and planting shade and ornamental trees.

Knapp Agricultural Day program for celebration in the schools (*Bul. George Peabody Col. for Teachers, n. ser.*, 2 (1913), No. 1, pp. 24, figs. 2).—The reasons for celebrating Knapp Agricultural Day and the establishment of the Seaman A. Knapp school and farm, the work to be undertaken by the school, and a suggested program for Knapp Agricultural Day are outlined, and hints and material for carrying out the program are suggested.

References for use in agricultural nature-study, G. H. TRAFTON (*Mankato, Minn.: State Normal School*, [1914], pp. 39).—This is a topical list of references to nature-study literature.

Agricultural extension in the high school, A. W. NOLAN (*Ill. Agr.*, 19 (1914), No. 3, pp. 230, 231, fig. 1).—The author calls attention to four distinct modes of approach to agricultural extension work that may be made in the high schools of Illinois offering agricultural courses, viz, the community survey, home-project work, individual work among farmers, and the organization of farmers' interests.

Edgar County country life clubs (*Paris, Ill.: county Supt. Schools*, [1914], pp. 20).—Programs and suggestions for community meetings are presented.

Report of the women's institutes for the Province of New Brunswick, 1913 (*Rpt. Women's Insts. New Brunswick, 1913*, pp. 174, fig. 1).—This is the second annual report of the women's institutes in New Brunswick, including the proceedings of the annual convention held in 1914, together with addresses and statistical data on the number of institutes, and their membership, attendance, receipts, and expenditures.

MISCELLANEOUS.

Twenty-sixth Annual Report of Alabama College Station, 1913 (*Alabama Col. Sta. Rpt. 1913*, pp. 35).—This contains the organization list, a financial statement for the fiscal year ended June 30, 1913, and reports of the director and heads of departments on the work and publications of the station during the year.

Annual report of the director for the fiscal year ending June 30, 1913 (*Delaware Sta. Bul. 103* (1914), pp. 16, fig. 1).—This contains the organization list and the report of the director on the work and publications of the station. It includes a financial statement for the fiscal year ended June 30, 1913.

The uses of the agricultural experiment station, E. H. JENKINS (*Connecticut State Sta. Bul. Inform. 6* (1915), pp. 4).—The work of the station for individual farmers is explained and the conditions under which it may be done are briefly noted.

Program of work of the United States Department of Agriculture for the fiscal year 1915 (*Washington: Govt.*, 1914, pp. 278).—The proposed activities of this Department are set forth in project form.

Federal legislation, regulations, and rulings affecting agricultural colleges and experiment stations (*U. S. Dept. Agr., Office Expt. Stas., Federal Legislation [etc.] Affecting Agl. Cols. and Expt. Stas.* (1914), pp. 28).—A revision to July 1, 1914, of the circular previously noted (*E. S. R.*, 25, p. 393).

NOTES.

Arizona University.—The legislature has accepted the provisions of the Smith-Lever Act and authorized the necessary appropriations. It also has empowered counties to appropriate not exceeding \$1,000 per annum for the payment of salaries and expenses of county farm advisors.

Kentucky Station.—L. R. Himmelberger, instructor in bacteriology in the Michigan College and assistant in the station, has been appointed assistant in the hog cholera serum production, beginning March 1.

Maryland College.—The short courses in agriculture and domestic science which closed March 13 were marked by increased attendance and interest over previous years. The new course in road making and maintenance attracted special attention in the State.

Missouri University and Station.—The resignations are noted of H. K. Thatcher, assistant in the soil survey, and B. Szymoniak as assistant in horticulture, the latter to become associated with the fruit and truck-crop demonstration work of the North Carolina College. B. L. France has been appointed farm advisor for St. Francis County and M. E. Hays assistant in horticulture.

Montana College and Station.—Appropriations have been made by the legislature for 1915-16 of \$85,000 for college maintenance, \$59,000 for station maintenance, \$5,500 for the dry farming substation, \$2,500 for the horticultural substation, \$1,000 for the Huntley substation, \$5,000 for the Northern Montana substation, \$4,000 for the grain laboratory, \$10,000 for farmers' institutes, and \$13,182 for agricultural extension. For the following year these grants are continued with increases of \$2,500 for the station, \$500 for the grain laboratory, and \$3,000 for extension work. In addition \$2,000 was granted the station as a revolving fund for the hog cholera serum work.

The annual farmer's week, January 25-30, is reported as the most successful yet attempted.

New Mexico College and Station.—The legislature has appropriated \$30,000 for college maintenance and \$5,000 for station work. The latter is the first appropriation ever made by the State for the maintenance of the station.

R. W. Latta, assistant in charge of dairying, was transferred March 1 to the extension division, being succeeded by J. R. Meeks of the animal husbandry department and he in turn by R. L. Stewart.

Oklahoma College and Station.—The faculty has decided to raise the entrance requirements to the full 15 unit credits. A 3-year secondary school course of a preparatory nature will be offered by the college until the high schools of the State can provide the necessary facilities. In conjunction with this secondary school course there will also be a 3-year course in practical agriculture designed to supply farm boys with a practical course of study without high school preparation and who desire to return immediately to the farm.

M. A. Beeson, president of the Meridian (Miss.) Male College, has been appointed professor of agronomy and agronomist, vice O. O. Churchill. J. M.

Fuller, who has been associate professor of dairying in the South Dakota College and dairy bacteriologist in the station has been appointed head of the dairy department beginning April 1. C. A. Burns has been appointed assistant in dairying, and W. L. Blizzard and D. A. Spencer assistants in animal husbandry.

Texas Station.—The governing board of the State substations has been reconstituted as follows: P. L. Downs of Temple, president; Charles Rogan, of Austin, vice-president; J. E. Boog-Scott, of Coleman; and W. P. Hobby, of Beaumont. H. C. Stewart resigned March 1 as superintendent of the Pecos substation and has been succeeded as acting superintendent by J. W. Jackson, assistant superintendent of the Troupe substation.

Utah College and Station.—Dr. L. D. Batchelor, professor of horticulture and horticulturist since 1911, has been appointed associate professor of plant breeding in the Graduate School of Tropical Agriculture and associate in plant breeding work at the citrus substation at Riverside, Cal., and will also be engaged in extension work. The appointment took effect March 1.

West Virginia Station.—At the recent session of the legislature, \$20,000 per annum was appropriated for the current expenses of the station and \$35,000 and \$40,000 for the first and second years for agricultural extension work. An act was passed accepting the provisions of the Smith-Lever Act, and another act authorizing county courts to pay part of the salary of county agricultural agents, including women workers, whenever a county agricultural organization of not less than fifty members will guarantee their expenses.

Paul B. Bennetch, associate professor of dairy husbandry and dairyman at the station, resigned January 1, and the dairy husbandry work has been combined with the department of animal husbandry. G. L. Thompson, a recent graduate of the Iowa College, has been appointed instructor in dairy husbandry.

Wyoming University and Station.—Ex-governor Joseph M. Carey and Mrs. B. B. Brooks have been appointed to the board of trustees, the former vice Gibson Clark, deceased. S. M. Fuller, assistant in the wool department, has been appointed county agent for Sheridan County, beginning March 15, vice H. E. McCartney, who is to become secretary of the Horse Breeder's Association of Indiana.

Second Pan-American Scientific Congress.—Preliminary programs have been issued by the State Department for this congress, which will hold its next session in Washington, D. C., from December 27, 1915, to January 8, 1916. Appropriations aggregating \$50,000 have been made by the United States for the congress, and William Phillips, Third Assistant Secretary of State, is chairman of the executive committee which is charged with its organization and procedure. George M. Rommel, of the Bureau of Animal Industry, is the representative of this Department on the executive committee.

The congress will be organized into nine sections. Workers in agricultural science will be especially interested in Section 3, conservation of natural resources, agriculture, irrigation, and forestry, which will be devoted to a consideration of the conservation of (a) mineral resources, (b) forests, (c) water for power, (d) animal industry, and (e) plant industry, and to discussions of the agricultural phases of irrigation and the marketing and distribution of agricultural products. Section 2, astronomy, meteorology, and seismology, is to include discussions of agricultural meteorology; Section 4, education, problems of agricultural education and research; Section 5, engineering, the engineering features of irrigation and drainage; Section 7, mining and metallurgy, economic geology and applied chemistry, papers on fertilizers and other agricultural chemical industries; and Section 8, public health and medical science, papers on nutritional diseases, food supply, etc.

Membership in the congress is open to official delegates of the countries represented, representatives of the universities, institutes, societies, and scientific bodies of these countries, and others who may be invited by the executive committee. Americans prominent in the field of science may also be appointed honorary members by the executive committee.

The official languages of the congress will be English, Spanish, Portuguese, and French. All papers should be received by October 1 and should be accompanied by résumés of not over 1,500 words followed by a footnote giving a bibliography of the subject. It is suggested that papers have special reference to the trend of recent progress and probable development in the immediate future.

Federal Agricultural Legislation.—Practically all the agricultural legislation to be completed at the closing session of the Sixty-third Congress was embodied in the agricultural and other appropriation acts, discussed editorially in this issue. A standard barrel was prescribed for fruits, vegetables, and other dry commodities. For commodities other than cranberries, this standard barrel must contain 7,056 cubic inches, while that for cranberries must have staves 28.5 inches in length and not greater than 0.4 inch in thickness, a diameter of head of 16.25 inches, a distance between heads of 25.25 inches, and a circumference of bulge of 58.5 inches, outside measurement. Sales of these commodities, except by weight or measure, in barrels of smaller capacity than these standards or subdivisions known as thirds, halves, or three-fourths barrels are prohibited under penalty of a fine not exceeding \$500 or imprisonment not exceeding 6 months, except that foreign shipments may be made which comply with the laws of the importing country. Reasonable variations are permitted under regulations to be established by the Department of Commerce. The act becomes effective July 1, 1916.

Under another act, one section of each township in the Tanana Valley, Alaska, is, with certain exceptions, reserved for the support of a territorial agricultural college and school of mines. A tract of four sections near Fairbanks is, aside from existing claims, granted to the Territory as a site for this institution. A portion of this tract is now occupied by the Fairbanks substation, and the act provides that it may continue to be used for that purpose until otherwise ordered by the President or Congress.

Agriculture and Domestic Science in Missouri High Schools.—According to a study recently made by W. J. Bray, professor of chemistry at the State Normal School, Kirksville, Mo., agriculture is the only recognized high school science that shows any gain in its percentage of enrollment for the 9 years from 1905 to 1914, viz, 300 per cent, while the enrollment in science as a whole, excluding domestic science, has declined from 64.4 to 49.2 per cent. Domestic science, though not taught as a science, has increased its enrollment from 9.3 per cent in 1906, when it was introduced into the high schools of Missouri, to 13.3 per cent in 1914. It is concluded that science is not holding its own because, as taught, it is failing to meet the popular demand for a practical usable education, and that there is no room in the secondary school for science for science sake.

Agriculture in Tennessee High Schools.—To adapt county high schools to the operations of the Smith-Lever act, an experiment is being made in the new Tennessee high school course of study in dividing the year into three terms of 12 weeks each instead of two terms of 18 weeks each. The demonstrators in agriculture and home economics are to spend the fall and spring terms in the field and the winter term in the high schools. Plans are being made for short courses for adults during these winter terms at several of the high schools,

notably at Farragut and Benton. The agricultural work will be begun at once but the home economics work will be delayed until next year in order that plans can be more carefully matured.

Government Aid to Agriculture in Greek Macedonia.—During 1914 the Ministry of National Economy of Greece expended more than \$16,000 for repairing and equipping the model farm of Saloniki, which is to be designated the principal agricultural school in New Greece. This school, which was established 20 years ago under the Turkish régime, has three buildings for scholastic purposes (one of which contains a museum and also a chemical laboratory), a station for breeding purposes, etc. The Greek government expects to complete the construction of a large new school building which was started before the Balkan wars. The farm is devoted to the growing of cotton, tobacco, sesame, sorghum, barley, oats, beets, and other plants and vegetables, and there is also a modern dairy and cheese house. Modern agricultural machinery and chemical fertilizers are used, and a nursery with about 100,000 trees of various kinds, including a large number of fruit trees, is expected to be of service in replanting the deforested sections of Macedonia. Improved methods of silk culture have given very satisfactory results during the past year. A farm viticulturist visits the various villages to give advice to vine growers.

Agricultural Instruction in Ceylon.—In 1913 there were in Ceylon 282 government school gardens and 47 aided schools registered for the grants payable by the education department, viz, \$16.22 for a garden of an acre or more and \$9.73 for one not less than one-third of an acre in extent; 8,288 packets of seed and 4,496 plants were distributed to school gardens, seeds were tested for the agricultural society, and 4 hives of bees were stocked and supplied to applicants. A prize fund of \$811 was available, half the sum awarded to each garden being divided among five students showing the best work in both school and home gardening. A junior agricultural reader was prepared by the superintendent of school gardens, and a senior reader was in course of preparation. A circular containing instructions on the planting of school gardens was issued to teachers. Two assistant teachers of government vernacular schools and three probationary agricultural instructors were given training at the stock garden. A central agricultural school is to be established at Peradeniya.

Miscellaneous.—The death in the European War is reported of the Prussian Conservator of Forests, Professor Karl Fricke, director of the Forest Academy of München.

The King of England has given permission for the use of a portion of the royal estate by the school of forestry of Cambridge University, for purposes of experimentation and demonstration.

A convention was held in Chicago, February 12 and 13, of representatives of six of the agricultural magazines published by the agricultural colleges. Considerable progress is reported in the standardization of the size of publication, number of issues, advertising rates, etc.

A gift by Theodore N. Vail has been accepted by the Vermont legislature of the agricultural school at Lyndon and other land and equipment. The gift is estimated at about \$150,000.

The next annual meeting of the American Association of Farmers' Institute Workers has been fixed for August 13 and 14 at the University of California.

The new agricultural buildings of Oxford University, costing about \$30,000, have recently been occupied.

EXPERIMENT STATION RECORD.

VOL. XXXII

ABSTRACT NUMBER.

No. 6.

RECENT WORK IN AGRICULTURAL SCIENCE

AGRICULTURAL CHEMISTRY—AGROTECHNY.

Chemistry of agriculture, C. W. STODDART (*Philadelphia: Lea and Febiger, 1915, pp. VI+364, pl. 1, figs. 83*).—This book on general agricultural chemistry is intended as a brief treatise, particularly for students, but sufficiently elementary for general reference. The contents are as follows: The plant: Germination of the seed, growth of the plant, plant compounds, and crops; factors in plant growth: The air, the soil-organic matter, the soil-inorganic matter, fertilizers, lime, farm manure, soil and fertilizer analysis, insecticides and fungicides, and the gas engine; the animal: The chemistry of animal physiology, food and digestion, and milk and dairy products.

The farmer as a manufacturer, A. T. STUART (*Canada Expt. Farms Bul. 20 (1914), 2. ser., pp. 16*).—An outline in popular language of some basic principles in agricultural chemistry. That the farmer is the world's real manufacturer of proteins, fats, carbohydrates, and fiber for making clothes is pointed out. The object of the bulletin is to present in a similar manner some illustrations of the chemical processes which take place in vegetable and animal life and to show how the farmer, through the agency of his crops and stock, uses the raw materials supplied by nature for the manufacture of his finished products.

Dairy chemistry: A practical handbook for dairy chemists and others having control of dairies, H. D. RICHMOND (*London: C. Griffin & Co., Ltd., 1914, 2. rev. ed., pp. XI+434, figs. 49*).—The second edition of this work, the first of which was issued in 1907. It is stated that the obsolete portions of the text have been eliminated and replaced by more recent matter.

Analytical chemistry.—I, Qualitative analysis, II, Quantitative analysis, F. P. TREADWELL (*Analytische Chemie. Leipzig: F. Deuticke, I, Qualitative Analyse, 1914, 8. ed. rev. and enl., pp. XII+522, pls. 3, figs. 25; II, Quantitative Analyse, 1913, 6. ed. rev. and enl., pp. IX+734, pl. 1, figs. 28*).—Revised and enlarged editions of this well-known work.

The germplasm as a stereochemic system, E. T. REICHERT (*Sci. Amer. Sup., 78 (1914), Nos. 2023, pp. 226, 227; 2024, pp. 242, 243*).—The thesis of this paper is that every individual is a chemical entity that differs in characteristic particulars from every other. The subject is discussed in the light of the author's researches, previously noted (*E. S. R., 31, p. 804*).

The constituents of the leaves and stems of *Daviesia latifolia*, F. B. POWER and A. H. SALWAY (*Jour. Chem. Soc. [London], 105 (1914), No. 617, pp. 767-778*).—"The material employed for this investigation consisted of the leaves and stems of *D. latifolia* (natural order Leguminosæ), which had been specially

collected for the purpose in Victoria, Australia. An alcoholic extract of the material, when distilled with steam, yielded a small amount of a pale yellow essential oil, which possessed a pleasant, aromatic odor, and gradually deposited some crystals of benzoic acid.

"From the portion of the alcoholic extract which was soluble in water the following definite compounds were isolated: (1) Benzoic, salicylic, p-coumaric, and fumaric acids; (2) a crystalline benzoyl derivative of a new disaccharid (glucoxylose), which possesses an extremely bitter taste. This bitter substance has the empirical formula $C_{25}H_{32}O_{12}H_2O$, melts at 147 to 148° , and has been designated dibenzoylglucoxylose; (3) a quercetin glucosid, $C_{27}H_{30}O_{16}$, which is probably identical with rutin. The aqueous liquid contained, furthermore, a quantity of sugar, which yielded d-phenylglucosazone (melting point 210°).

"The portion of the alcoholic extract which was insoluble in water, consisting chiefly of resinous material, amounted to about 8.6 per cent of the weight of the drug. From the resinous material there were isolated: (1) Myricyl alcohol, $C_{30}H_{62}O$; (2) hentriacontane, $C_{31}H_{64}$; (3) a phytosterol, $C_{27}H_{46}O$; (4) a mixture of fatty acids, consisting of palmitic, stearic, and linoleic acids. The resin also contained a considerable proportion of the above-mentioned dibenzoylglucoxylose, together with free benzoic acid.

"This investigation has shown that the bitterness of the leaves of *D. latifolia* is due to the crystalline substance which has been designated dibenzoylglucoxylose. The latter represents a type of compound which has not hitherto been observed to occur in nature, and its characters will be fully described in a subsequent communication."

The nitrogenous constituents of hops, A. C. CHAPMAN (*Jour. Chem. Soc. [London]*, 105 (1914), No. 621, pp. 1895-1907).—A detailed study of the various nitrogenous constituents present in hops, made for the purpose of noting especially those substances which might be of help in solving some of the vexed questions as to the therapeutic effects of various kinds of beers, and also as to whether the nitrogenous substances would have some effect on the vitality of the yeast organism. In some cases the hops were extracted in the laboratory and in others the extract prepared by a commercial concern was used.

The investigation was confined especially to those substances soluble in boiling water. From the aqueous solution histidin, arginin (?), betain, cholin, asparagin, adenin, hypoxanthin, a small amount of a definitely alkaloidal substance, a colored nitrogenous substance which was acid in character and soluble in alkali and forming a brownish-red solution, and substances exhibiting properties of complex amino acids or polypeptids, or mixtures of the same, were isolated. A crystalline substance melting at about 70° C., which was a nonnitrogenous compound and almost insoluble in alcohol, was also noted. Potassium nitrate was obtained from an alcoholic extract of hops.

The carbohydrate matter was also investigated and will be reported upon in a later communication. No alkaloids giving reactions similar to morphin were noted except with one method and then only a trace.

An investigation of the diastase of alfalfa and the effect of rapid curing upon the food value of alfalfa, R. C. SHUEY (*Jour. Indus. and Engin. Chem.*, 6 (1914), No. 11, pp. 910-919, fig. 1).—The fact that diastase has been demonstrated in a large number of plants and in various parts of plants indicated the probability of the diastatic content of fodders bearing an important relation to the availability of the food constituents. "Experiments were conducted along similar lines, using alfalfa as an example of a highly diastatic plant, and endeavoring to learn the optimum conditions for the production and retention of diastase in a cured hay."

"The diastatic activity of alfalfa is greater in the morning or after a period of darkness than after a period of exposure to light. There is much more diastase present in the plant during the warm, active, growth-producing summer than during the spring or fall. Young plants contain more diastase than older ones. Drying at elevated temperatures in a humid atmosphere decreases the diastatic activity, even though the temperature is only 50° F. Drying in a current of air with gradually increasing temperature, on the other hand, increases the activity markedly. Light and weathering in the field tend to destroy the diastase. Rain during curing is very detrimental. Highly diastatic alfalfas generally show a greater solubility in water by autodigestion than samples low in diastase. However, the degree of solubility in water can not be increased above a certain limit. The loss in digestible constituents during handling and curing in the field may vary from 20 per cent under favorable conditions to as much as 50 per cent under adverse weather conditions.

"Curing by artificial heat, using the principle of countercurrents, gives a hay of better color, odor, and flavor than can be produced by other means. The hay appears to retain many of the valuable properties of the green plant, which are ordinarily lost in curing. The cost of artificial drying is estimated to be less than the losses generally sustained in field curing and, therefore, it ought to be possible to conduct drying at a profit when the drier can be located near both field and source of fuel."

Concerning the presence of diastase in certain red algæ, E. T. BARTHOLOMEW (*Bot. Gaz.*, 57 (1914), No. 2, pp. 136-147).—"There is present in the red algæ a diastase which will digest the starch of higher plants. The manner of action of this enzym indicates that it is at least partially composed of a translocation diastase. The diastase of the red algæ, like that of the higher plants, is probably not composed of a single enzym, but of a series of amylases and dextrinases. Judging by the action of the algal extract upon cornstarch, the diastase is a rather slow-working enzym.

"The series of digestion processes resulting from the application of the algal diastase to cornstarch would indicate that the substance composing the grains of the red algæ is very similar to that of the starch grains of higher plants."

The survival of amylase in dried fodders, R. E. NEIDIG (*Jour. Amer. Chem. Soc.*, 36 (1914), No. 6, pp. 1312-1314).—"The amylolytic activity of five dried fodders about six months old, viz, two alfalfa hays, clover hay, timothy hay, and corn stover, was calculated on the basis of 100 gm. of dry fodder, the method of Sherman et al. (*E. S. R.*, 24, p. 122) being used for determining the amylolytic activity. "The addition of sodium phosphate and sodium chlorid as electrolytes failed to increase the activity, probably because electrolytes were abundantly present in the crude enzym preparations."

The influence of the fat content of milk upon the rate of coagulation by rennet, A. KREIDL and E. LENK (*Biochem. Ztschr.*, 63 (1914), No. 2-3, pp. 151-155, figs. 3).—"Despite the fact that investigations have been made under uniform conditions the coagulation time of milk by rennet was not found to be constant. The rate is dependent upon the fat content of the milk, the time required for coagulation increasing with the fat content. The work was done with skim milk, whole milk, ordinary cream, and whipped cream.

A contribution to the biochemistry of cheese ripening.—I, About the occurrence of p-oxyphenylethylamin in normal cheese and its formation by lactic acid bacteria, F. EHRLICH and F. LANGE (*Biochem. Ztschr.*, 63 (1914), No. 2-3, pp. 156-169).—"Lactic acid bacteria are said to form p-oxyphenylethylamin from amino acids, i. e., tyrosin by the scission of carbon dioxid from the

same. Appreciable amounts of this substance were noted in normal Swiss and Emmental cheese, especially in the latter. See also previous notes (E. S. R., 14, p. 1115; 21, p. 478).

An organism similar to those belonging to the *Bacillus casei* group was isolated from Swiss cheese. The indications were that oxyphenyl lactic acid was present in both cheeses but no tyrosol could be noted.

The gravimetric determination of calcium as calcium oxalate, S. Goy (*Chem. Ztg.*, 37 (1913), No. 131, pp. 1337, 1338).—For the determination of calcium in foods, soils, plant ashes, etc., the methods in vogue are tedious and time-consuming. In most cases the calcium is determined as oxid or carbonate. Attempts to weigh the calcium oxalate precipitate directly after drying resulted in showing the feasibility of the procedure providing the drying was done in the Gooch crucible. The precipitate when dried at from 100 to 105° C. was found to contain one molecule of water of crystallization which will not volatilize by continued drying at the above-named temperatures. By drying at 130°, the temperature used in the perchlorate method, a loss in weight is experienced and the salt goes over into the anhydrous condition.

Study of methods used in alkali determinations, A. E. VINSON and C. N. CATLIN (*Arizona Sta. Rpt.* 1913, pp. 274-277).—This is a comparative study of the methods for alkali determinations in soil, which was prompted by the fact that some investigators were reporting results for black alkali far in excess of the limit usually acceptable as that of tolerance by most economic crops in the presence of very large amounts of gypsum, a result which could not be obtained by methods in use at other stations.

The soils used in comparing the methods were a strongly black alkaline soil from the University of Arizona farm, a moderately black alkaline soil from Santa Cruz Valley, and a gypsum soil from Santa Cruz Valley, and the methods studied were the California, Montana, Bureau of Soils, Texas, New Mexico, Utah, and Arizona. The determinations made were total solids, chlorids as sodium chlorid, and alkalinity expressed in terms of sodium carbonate. The comparisons show that the Arizona method gives high results in all determinations except the chlorids. This is especially true for black alkali, and it was found that it requires a fairly large proportion of water to soil and long digestion to reach a maximum extraction of total solids. Direct titration of the soil filtrate with methyl orange as the indicator may show black alkali in a strongly gypsum soil and the percentage would increase with the carbon dioxid in the water used in making the solution.

Colorimetric estimation of iron in water, F. GOTHE (*Ztschr. Untersuch. Nahr. u. Genussm.*, 27 (1914), No. 9, pp. 676-683; *abs. in Jour. Chem. Soc. [London]*, 106 (1914), No. 621, II, pp. 581, 582).—It is claimed that the colorimetric method of determining iron by means of potassium thiocyanate is liable to yield low results when ferrous salts are present in a water in which the iron has been insufficiently oxidized by treatment with hydrochloric acid and potassium chlorate. The error is due to the influence of the hydrochloric acid on the ferric thiocyanate and to a certain extent on the quantity of thiocyanate added. More satisfactory results can be obtained by oxidation with nitric acid.

The following procedure is recommended: "One hundred cc. of the water is acidified with 1 cc. of hydrochloric acid (specific gravity 1.125), a few crystals of potassium chlorate are added, and the mixture is evaporated to dryness. The residue is treated with 1 cc. of hydrochloric acid (specific gravity 1.125) dissolved in distilled water, diluted to 95 cc., and 5 cc. of 10 per cent potassium thiocyanate added. The coloration is compared with that produced by a known quantity of iron under similar conditions."

A simple, exact, and reliable method for the quantitative determination of lead in drinking water, C. REESE and J. DROST (*Gesundh. Ingen.*, 37 (1914), No. 8, pp. 129-133).—After discussing the faults of the various methods hitherto proposed for estimating the amount of lead in water, a colorimetric method is suggested. It consists essentially in noting the color produced in a volume of water (previously evaporated with concentrated hydrochloric acid and again made up to volume with distilled water) with hydrogen sulphid. A comparison is made with tubes containing a known amount of acetic acid solution, lead nitrate of known strength, and hydrogen sulphid.

Estimation of iodine, especially in organic substances, R. GRÜTZNER (*Chem. Ztg.*, 38 (1914), No. 72, pp. 769, 770; *abs. in Jour. Chem. Soc. [London]*, 106 (1914), No. 621, II, pp. 573, 574).—A known quantity of the substance is mixed with powdered sodium hydroxid, moistened and dried, sodium or barium peroxid is added, and the mixture is incinerated. After cooling, a small quantity of charcoal is added and the mixture is heated again. The fused mass which results is then dissolved in water and filtered. If barium peroxid is used the solution can be treated with carbon dioxide and sodium sulphate before filtration. The resulting alkaline solution is boiled after the addition of a little crystalline potassium permanganate and talcum, acidified with sulphuric acid, boiled, rendered alkaline, and boiled again after adding alcohol. The mixture is filtered while hot, the excess of alcohol being expelled by boiling the filtrate, which is then rendered slightly acid with a mixture consisting of sulphuric and phosphoric acids. Ammonium sulphate is added, the mixture boiled for three minutes, cooled, and the iodic acid titrated after the addition of sulphuric acid and potassium iodid. Six atoms of iodine are thus liberated and when titrated they correspond to one atom of iodine in the original substance.

Colorimetric estimation of creatin, E. BAUR and G. TRÜMLER (*Ztschr. Untersuch. Nahr. u. Genussmit.*, 27 (1914), No. 10, pp. 697-713, figs. 3; *abs. in Jour. Chem. Soc. [London]*, 106 (1914), No. 621, II, p. 595).—An investigation of Jaffé's method for the estimation of creatin as regards the influence of time, temperature, and concentration of acid on the conversion of creatin into creatinin.

It was found that in the case of meat extracts the creatin is converted completely when 10 gm. of the extract is heated with 100 cc. of normal hydrochloric acid for four hours at 97° C. The estimation of creatin in meat extracts is carried out as follows:

"Ten gm. of the extract is dissolved in water to give 100 cc. of solution; 5 cc. of this solution is then treated with 15 cc. of saturated picric acid solution and 5 cc. of 10 per cent sodium hydroxid solution. After seven minutes the mixture is diluted to 500 cc., and the coloration compared with that exhibited by a definite depth of twice-normal potassium dichromate solution. The result gives the quantity of pre-formed creatinin. A second portion of 10 gm. of the sample is then heated with hydrochloric acid as described above; after cooling, 5 cc. of the solution is neutralized, treated with picric acid and sodium hydroxid, diluted to 500 cc., and the coloration compared. The amount of creatin plus creatinin is thus obtained. The comparisons should be made while the solutions are at a temperature of 17°. Liebig's meat extract was found to contain from 3.72 to 9.76 per cent of creatinin and from 2.09 to 5.58 per cent of creatin. Meat extracts prepared by the authors (1 kg. of flesh yielded 30 to 35 gm. of extract) contained from 7.5 to 8.9 per cent of creatin plus creatinin."

Flours, starches, bread, alimentary pastes, and pastry, M. ARPIN (*Farines Féculés et Amidons, Pain, Pâtes Alimentaires, Pâtisseries*. Paris: C. Béranger, 1913, XIII+190, pls. 8, figs. 9).—The book includes methods of analysis of these substances, the interpretation of the analyses, and legislation in regard to

these products. The various sources of flour are considered and photomicrographs are included.

The rapid determination of boric acid normally present in foods, or extraneous boric acid, G. BERTRAND and H. AGULHON (*Ann. Falsif.*, 7 (1914), No. 65, pp. 119-121).—With a colorimetric method devised by the authors it is possible to estimate quantitatively and easily small amounts of boric acid in foods with sufficient accuracy to determine whether the boric acid was present normally or had been added as a preservative. This is demonstrated by giving the results of an examination of a large variety of substances, including fruits, vegetables, cereals, meats, eggs, and milk.

Detection of formaldehyde in foods, F. RACHEL (*Pharm. Zentralhalle*, 54 (1913), No. 31, pp. 759-761; *abs. in Jour. Chem. Soc. [London]*, 104 (1913), No. 612, II, p. 891).—Utilizing the suggestion made by Friese, the following process for the detection of formaldehyde in meat, caviar, and fish is recommended:

Acidify the substance with phosphoric acid, heat in a current of steam, and mix 1 to 2 cc. of distillate with 4 cc. of milk free from formaldehyde and 10 cc. of hydrochloric acid (sp. gr. 1.19) to which has been added 1 drop of nitric acid per 300 cc. When formaldehyde is present a bluish-violet coloration appears. Colors appearing after five minutes are taken as a negative result. When much formaldehyde is present milk does not give the reaction and the experiment must be repeated with pure water.

Detection and estimation of formic acid, H. FINCKE (*Biochem. Ztschr.*, 51 (1913), No. 4, pp. 253-287, figs. 2).—The first part of this paper deals with the occurrence of formic acid, and the second with the reactions which were found useful in its qualitative and quantitative determination. Some of the quantitative methods are given with much detail.

The detection of formaldehyde in plants, H. FINCKE (*Biochem. Ztschr.*, 52 (1913), No. 3-4, pp. 214-225; *abs. in Jour. Chem. Soc. [London]*, 104 (1913), No. 610, I, p. 947).—"For these researches [see also above] the Grosse-Bohle reagent for the detection of formaldehyde was employed. This consists of a rosanilin salt in the presence of sulphites and free hydrochloric acid, and is to be distinguished from the ordinary magenta-sulphite solution for detection of aldehydes, by the presence of free mineral acid. It was found by the author to be capable of detecting formaldehyde in the dilution 1:500,000, giving with the aldehyde a violet color. In numerous experiments on plants no indication of the presence of formaldehyde was obtained with the use of this reagent; furthermore, formaldehyde could not be detected by the reagent after addition to certain living plants.

"The author draws the conclusion that his investigations throw no light on the correctness or otherwise of Bayer's assimilation hypothesis."

About the detection of small amounts of formaldehyde and some formaldehyde compounds with fuchsin-sulphurous-hydrochloric acid, H. FINCKE (*Ztschr. Untersuch. Nahr. u. Genussmtl.*, 27 (1914), No. 1-3, pp. 246-253).—As formaldehyde is decomposed under certain conditions it is essential to know to what extent it occurred in foods. After repeating some of the work noted above, the author lays stress upon the fact that the fuchsin-sulphurous-hydrochloric acid test is less influenced by other substances than any of the other reagents used for detecting formaldehyde and consequently should find a wider field of application. The reaction differentiates itself from the usual aldehyde test by the fact that it is conducted in a medium containing an excess of free acid.

Attempts to substitute for rosolic acid similar coloring matters (highly methylated fuchsin, acid fuchsin, and acid violet) were unsuccessful. The fuchsin homologues, parafuchsin (C_{19}), fuchsin (C_{20}), fuchsin (C_{21}), and new fuchsin

(C₂₂), were compared, and all of these were decolorized by sodium sulphite with the exception of parafuchsin and the new fuchsin, which were only partly decolorized. The color of none of the dyes was affected by the addition of acid. Fuchsin (C₂₀) is the preferred reagent.

Formaldehyde is tested for directly in the distillate from the food and especially in the first runnings, providing that it is not in a fixed state. In milk or colorless substances the reaction can be made without previous distillation. Strongly colored solutions, such as wines and fruit jams, must first be decolorized with animal charcoal. The diminution of formaldehyde in food is said to be due either to fixation or to decomposition by micro-organisms. The extent of formaldehyde fixation is shown by the fact that rhubarb leaves having an addition of 1:10,000 when heated for an hour at 100° C. give no reaction for the substance.

Formaldehyde may be converted into hexamethylenetetramin and methylal. Urine and urea fix formaldehyde very easily while milk fixes it only slightly. As hexamethylenetetramin reacts only slightly at the beginning with fuchsin-sulphurous-hydrochloric acid, it is advisable to heat 10 parts of the solution with from 1 to 2 parts of hydrochloric acid on a water bath.

The detection of formaldehyde-sulphurous acid is also considered.

About the utility of vacuum distilling methods for detecting formic acid, T. MERL (*Ztschr. Untersuch. Nahr. u. Genussmtl.*, 27 (1914), No. 10, pp. 733-743).—This work deals especially with the separation of formic acid from acid-sugar-containing fluids. It indicates that it is possible, by observing the specifications set down by Fincke (see above), to obtain the formic acid from such fluids without the formation of acid during the distillation process under diminished pressure. The apparatus employed was Anschütz and Reitter's.

The preliminary work was done with solutions of formic acid; formic and tartaric acids; formic acid and saccharose; formic acid, glucose, and tartaric acid; levulose; levulose and tartaric acid; invert sugar and saccharose; saccharose and tartaric acid; saccharose and phosphoric acid; and saccharose, phosphoric acid, and tartaric acid. Although very small amounts of formic acid were found in the case of sugar solutions containing tartaric, phosphoric, or no acids, with the ordinary vacuum distillation process it usually originated from impurities present in the sugar. The steam vacuum method has a greater tendency to form formic acid than the other methods.

Tests were also made with authentic samples of honey which had been analyzed previously by Fincke's procedure. Distillates from the head, thorax, and abdomen of bees (*Apis mellifera*) showed formic acid to be present in traces. A few distillation tests with benzoic, salicylic, and cinnamic acids led the author to conclude that the steam distillation method is preferable to the shaking-out method in the detection of preservatives.

Determination of formic acid in ketchup, C. A. PETERS and L. P. HOWARD (*Jour. Indus. and Engin. Chem.*, 7 (1915), No. 1, pp. 35-37).—This gives the details of a study made for the purpose of adapting the Fincke method (E. S. R., 26, p. 312), to the determination of formic acid in ketchup with the apparatus described. From 91 to 92 per cent of the total formic acid added to ketchup may be recovered in one and a half hours providing about 1,000 cc. of distillate is passed over.

The unsaponifiability of mowrah fat and its significance for the detection of mowrah fat in edible animal and plant fats, P. BERG and J. ANGERHAUSEN (*Ztschr. Untersuch. Nahr. u. Genussmtl.*, 27 (1914), No. 10, pp. 723-731).—Mowrah fat is one of the raw materials used in the margarin industry. It has the consistency of American lard, and since its quality has been improved it is

considered a better substitute for animal fat than coconut or palm fat. The fat when liquefied by heat and allowed to cool at room temperature solidifies only partly. The fully solidified fat, like palm and coconut fats, shows in its surface and bottom a cellular and honeycomb-like appearance. Its color is white with a greenish hue and only when heated is an odor perceptible. It has a nut-like taste with a slight oily-soapy flavor.

The physical and chemical properties are as follows: Polarization (20 gm. of fat in chloroform to make 50 cc. in all) in a 200 mm. tube +0.9 circular degree which corresponds to a specific rotation (100 gm. fat in 100 cc. polarized in a 100 mm. tube) of +1.12; refraction at 40° C., 51.9 to 52.2; saponification number, 193.6 to 194; iodine number, 60.4 to 60.8; Reichert-Meißl number, 1.43 to 1.65; and Polenske (new butter) number, 0.4.

No coloration was obtained with the Baudouin, Halphen, or Bellier test. The Soltzien reaction was negative. The unsaponifiable material of this fat possesses many characteristics not present in other plant fats, especially the presence of an optically active substance. It was separated into an optically active $[a]_D +34$ substance, soluble in alcohol, and an inactive substance insoluble in alcohol.

Phytosterol could not be detected by either the Bömer or digitonin methods. This was due to the fact that mowrah fat contains only a very small amount of phytosterol. The unsaponifiable material present in mowrah fat, especially the alcohol-soluble optically active substance, is recommended as a basis for its detection in lard.

The detection of coconut oil in butter by the Polenske distillation method and the phytosterol acetate test of Bömer, C. BARTHEL and K. SONDÉN (*Ztschr. Untersuch. Nahr. u. Genussmit.*, 27 (1914), No. 6, pp. 439-453, figs. 2).—For detecting added coconut fat in butter three tests can be employed, viz, the Polenske number, the phytosterol acetate method (E. S. R., 16, p. 18), and the refractometric reading. While the presence of coconut oil in butter will lower the refractometric index of the mixture it sometimes occurs that such mixtures may still have a higher reading than some pure butters, and this makes it necessary to supplement the refractometric test by another. On the other hand, the Polenske figure of butter is increased by the addition of coconut fat. In some cases an addition of 5 per cent of coconut fat may be detected by this method, and 10 per cent can be detected with certainty.

Butter obtained from cows fed on turnip leaves, coconut cake, peas, vetch, or horse beans, when examined by the Polenske method gave figures indicating the presence of an adulterant. When this is found to be the case the Bömer phytosterol acetate test, which is not so easy to conduct as the other methods, will have to be resorted to, and when vegetable fats are present in butter the melting point of the acetate obtained will be higher. With it the presence of added coconut fat in an amount of 10 per cent or over can be proved without difficulty.

Before testing for coconut fat in butter, Baudouin's test for sesame oil should be made, as all Swedish margarins must contain an addition of sesame oil.

The estimation of the water and fat content of butter with a new apparatus, R. JUNGKUNZ (*Chem. Ztg.*, 38 (1914), No. 9, p. 91, fig. 1).—A description of the apparatus and the results obtained with it. The results are compared with those given by the ordinary drying method in nickel dishes with and without pumice.

A simplified and inexpensive oxidase apparatus, H. H. BUNZEL (*Jour. Biol. Chem.*, 17 (1914), No. 3, pp. 409-411, fig. 1).—A simplification of the apparatus previously described (E. S. R., 27, p. 9). The apparatus described previously

has not found its way into general use in plant physiological laboratories on account of its great cost.

"In addition to its simplicity and increased sensitiveness, the apparatus is much less fragile and very much easier to clean than the old one. As its only drawback must be mentioned the fact that there is no provision made for absorption of the carbon dioxid produced. Until the carbon dioxid production in the oxidation of the various oxidase reagents has been determined, the apparatus will furnish only comparative results."

See also other notes (E. S. R., 28, p. 314; 29, p. 550).

A proposed new standard loop for use in bacteriological tests of disinfectants, A. D. ST. JOHN (*Jour. Indus. and Engin. Chem.*, 6 (1914), No. 11, p. 940, fig. 1).—A description of a cube-shaped loop devised for the purpose of eliminating some of the errors and difficulties encountered in the present methods of determining the antiseptic power of disinfectants.

Home canning, F. E. MILLER (*Virginia Truck Sta. Bul.* 12 (1914), pp. 279-297, figs. 5).—This deals with methods of canning, especially those practiced in the home canning plant of the Virginia Truck Station. The bulletin is well illustrated, and gives explicit directions for canning, especially vegetables. A list of canning terms, with definitions thereof, is also given.

Fruit preserving: Canning, bottling, jam making, and candying peel, W. J. ALLEN (*Dept. Agr. N. S. Wales, Farmers' Bul.* 88 (1914), pp. 26, figs. 21).—This pamphlet contains directions for carrying out this work in the home and on a small scale. The outfits required for both canning and bottling are described in full and illustrated. Hints are also given on the selection and preparation of the fruit.

Manufacture of textile fibers from *Epilobium angustifolium*, K. SCHUMANN (*German Patent* 269,350, Jan. 6, 1912; *abs. in Chem. Ztg.*, 38 (1914), No. 14, *Repert.*, p. 66).—By proper fertilization of this plant a higher growth and better elasticity of the seed hairs are obtained. The seed hairs are then made rough with steam and spun.

METEOROLOGY.

Suggested changes and extension of the United States Weather Bureau service in California, G. S. BINCKLEY and C. H. LEE (*Proc. Amer. Soc. Civ. Engin.*, 41, (1915), No. 2, pp. 249-258, fig. 1).—It is pointed out that the present weather service in California is not adequate for gathering the mountain climatic data necessary to furnish a basis for the forecast of future stream-flow variation. It is, therefore, suggested that more and better equipped stations be established in the most productive mountain drainage areas, under men especially fitted to make and interpret observations bearing upon the relation of precipitation to stream flow. Among the suggested studies having this purpose in view are the following:

"(1) Annual snow surveys in the drainage areas of Sierra Nevada streams, (2) snow movement subsequent to precipitation, (3) the relation of temperature, forest trees, drifting, etc., to snow melting, (4) the detailed relation between topography and precipitation, (5) water evaporation from lakes or reservoirs, (6) evaporation from snow, (7) establish, maintain, and observe snow and rain gages at isolated points which can be reached only at long intervals, (8) any other investigations of practical value in the solution of the water supply and flood protection problems of the State."

A study of the influence of volcanic dust veils on climatic variations, H. ARCTOWSKI (*Science*, n. ser., 41 (1915), No. 1050, pp. 252-255).—Reviewing especially the effects of volcanic eruptions of 1883 (Krakatoa), 1902 (La

Soufrière, Pelée, and others), and 1912 (Katmai) on atmospheric temperature, with particular reference to his theory of pleionian variations (E. S. R., 31, p. 717), the author concludes that "the dust veil produced by the Krakatoa eruption affected atmospheric temperature very greatly. The violent volcanic eruptions of 1902 as well as the Katmai eruption of 1912 influenced the yearly mean temperature but very slightly or not at all. The pleionian variations of temperature have nothing in common with the presence or absence of volcanic dust veils."

A report on Montana climate, E. BURKE and R. M. PINCKNEY (*Montana Sta. Bul. 99 (1914), pp. 143, pl. 1, figs. 57; [Appendix] (1914), pp. 67-143*).—This bulletin contains a compilation of observations on temperature and precipitation by the experiment station at Bozeman and by the U. S. Weather Bureau at 37 other places in the State especially selected because of their geographic location and the length and completeness of their records. No place having a continuous record of less than ten years is included.

The more striking features brought out by the meteorological data are briefly summarized and illustrated by means of diagrams. In general Montana climate "clearly shows the characteristics of temperature due both to proximity to the Pacific Ocean and to its midcontinent situation; the former most marked in the west, the latter in the east. The influence of the north wind is predominant in winter over the plains region but is limited in the east-mountain district by the protective position of the lesser mountain ranges and combated by the warm winds from the Pacific Ocean, which modify the climate west of the Continental Divide and even extend their influence across the mountains.

"The total yearly precipitation of Montana varies from about 22 in. in the western part of the State to about 14 in. in the eastern. The greater precipitation is generally at the higher points, the lesser on the lower lands.

"The direction of this variation indicates that most of the rainfall of the State has its origin in the moisture-laden winds from the Pacific. The eastern part of the State receives less rain than the central and western, but a greater portion falls in the growing season. This fact tends to equalize the crop value of the rain at different points."

A study of the oldest and most complete records furnishes no evidence that the yearly precipitation is increasing, as many people believe. As regards temperature, it is stated that "the high portion of the State has less extremes of temperature, greater rainfall, and less wind.

"The lower altitude has greater extremes of temperature, less rainfall, more wind, and a longer growing season free from frost. The rainfall is so small that even though it comes at a favorable time it must be rightly used to secure good crops. This consideration involves selecting proper crops to use the rain at the time it comes and proper means to secure absorption of the water into the soil and to keep it there until it is needed by a useful crop."

The appendix gives monthly temperature records for 1898-1913.

[Weather observations and notes], M. A. BLAKE, B. D. HALSTED, ET AL. (*New Jersey Stat. Rpt. 1913, pp. 174-178, 611-614*).—The general weather conditions of the season of 1913 at the college farm at New Brunswick are described and data for temperature and precipitation for that year and for a number of preceding years are tabulated.

Meteorology, R. F. STUPART (In *Twentieth Century Impressions of Canada. London: Sells, Ltd., 1914, pp. 164-176, fig. 1*).—The meteorological and climatic conditions of Canada as a whole and of each of its provinces are summarized. The outstanding fact disclosed is that the climatic conditions are extremely varied but that the continental type of climate largely predominates, only the

immediate coastline of British Columbia having a climate of marine type such as that of northwestern Europe.

Salton Sea water, A. E. VINSON and C. N. CATLIN (*Arizona Sta. Rpt. 1913*, pp. 272-274).—In continuation of previous examinations (E. S. R., 29, p. 415), a complete analysis was made of a sample of Salton Sea water taken June 18, 1913, at the usual place southwest of Mecca, California.

The results show that from June 10, 1912, to June 18, 1913, the total solids in the water increased from 846.55 parts to 1,002.56 parts per 100,000. The water may now be considered as a 1 per cent brine. As in the previous year, calcium again showed a marked decrease, and the figures indicate that potassium is disappearing at a rapidly increasing rate. The ratio of potassium to sodium and total solids was 1:94:288 respectively in 1913, whereas the ratio in 1912 was 1:71.1:222 and in 1911 1:59.8:188.

The Salton Sea, D. T. MACDOUGAL (*Amer. Jour. Sci.*, 4. ser., 39 (1915), No. 231, pp. 231-250, figs. 6).—This article is condensed from the above.

Chemical composition of the water of Salton Sea and its annual variation in concentration, 1906-1913, W. H. ROSS and A. E. VINSON (*Carnegie Inst. Washington Pub. 193* (1914), pp. 35-48).—The investigations upon which the articles here referred to are based have already been noted from other sources (see above).

SOILS—FERTILIZERS.

Distribution of soil particles, DUKE OF BEDFORD and S. U. PICKERING (*Woburn Expt. Fruit Farm Rpt.*, 14 (1914), pp. 37-45, fig. 1; *abs. in Internat. Inst. Agr. [Rome]*, *Mo. Bul. Agr. Intel. and Plant Diseases*, 5 (1914), No. 9, pp. 1164, 1165).—A series of experiments to determine the influence of the rainfall on the distribution of the clay particles in a soil are reported. The samples were taken at monthly intervals at three depths of 6 in. each from a soil which had received moderate applications of artificial fertilizers for 18 years.

The amounts of suspended matter, after shaking the samples in water at intervals for 24 hours and allowing to settle for four hours, were found to vary considerably, the variation being greatest in the top 6 in. and least in the third 6 in. The latter contained more fine particles than the upper two layers together and a larger proportion of these was true clay. With one exception, an intimate relationship was found between the relative proportions of fine matter in the top 6 in. of soil and the inches of rainfall in the preceding 20 days, a larger proportion being found in the top soil after an increased rainfall and a smaller proportion after a decreased fall. The rainfall records for the preceding 30 days showed a similar but not so marked an agreement with the proportion of fine matter, from which it is concluded that the effect of the rainfall had partially worn off after 20 days.

It was found that if the upper and second depths of 6 in. are alone considered, the relative proportions of fine particles in the top layer do not follow the rainfall records so closely as when the whole 18 in. are considered, from which it is concluded that the effect of rain on the fine particles extends below the top 12 in. It is further concluded "that the actual amount of fine particles in the top layer, though perhaps the most important feature of the effect of the rainfall, is not the sole one, and that some redistribution of the fine particles also occurs. . . . It is evident that in this effect of rain on the flocculation of the soil, we have a factor which is amply sufficient to cause considerable difference in the behavior of plants in the same soil on different occasions."

The decomposition products of the aluminum silicate rocks, particularly the laterites of Madagascar, A. LACROIX (*Compt. Rend. Acad. Sci. [Paris]*,

159 (1914), No. 18, pp. 617-622).—The author compares the modes of decomposition of the aluminum silicate rocks of Madagascar and West Africa.

In West Africa he distinguishes two zones of decomposition, namely, the so-called zone of separation in which decomposition is governed by the nature of the original rocks and above it the zone of concretion. In the first zone in the case of gabbros, diabases, and the nepheline syenites most of the silica, lime, magnesia, and alkalis are eliminated and crystalline aluminum hydrate produced. In the case of granites, gneisses, and mica-schists the decomposition is progressive, first producing an aluminum silicate, sometimes crystalline but more frequently colloidal, which is little by little transformed into the colloidal hydrate. In the zone of concretion silica and other elements are eliminated and in most cases the tendency is toward the formation of progressively pure aluminum hydrate in both crystalline and colloidal forms. The iron accompanying aluminum hydrate is usually in the hydrate form and moves by degrees from the lower to the upper zone where it accumulates, thus tending to form an iron crust at the surface.

The iron crust is usually absent from the Madagascar soils. The surface soils are most frequently red soils and decomposition is not governed entirely by the nature of the original rock. The laterization of diabases, basalts, and syenites is similar to that in the zone of separation in African soils, and gneisses, mica-schists, and granites are most frequently transformed into aluminum silicate and colloidal aluminum hydrate, which is the most frequent cause of the red soils. Granite and pegmatite are sometimes transformed into kaolin, free aluminum hydrate, and colloidal aluminum silicate. Another frequent mode of decomposition not observed in Africa consists in the production from granite of clear white laterite containing undecomposed quartz. The author concludes that the red soils of Madagascar are not laterites but lateritic clays and frequently only common clays.

Soils of the Sassafras series, J. A. BONSTEEL (*U. S. Dept. Agr. Bul. 159* (1915), pp. 52, pls. 9, fig. 1).—This bulletin deals with the distribution, characteristics, crop adaptabilities, and fertility requirements of the soils of the Sassafras series, which are confined in their distribution to the northern portion of the Atlantic Coastal Plain, extending from the southern end of the Chesapeake Bay region through central and southern New Jersey to the western end of Long Island, New York.

The different soil types of the series range in texture from a gravelly loam through sands and sandy loams to a heavy silt loam, and consist of water-laid materials, chiefly formed as marine, estuarine, and fluvial terraces, but including some areas formed by the deposition of glacial outwash materials. They are distinguished by the yellow or brown color of the surface soils, by the yellow or reddish-yellow color of the subsoils, and by the prevalence of an underlying layer of gravel or gravelly sand at depths of from 2 to 6 ft. or more.

"The drainage of the soils of the . . . series is generally good and only the more level areas and those remote from stream channels are decidedly in need of artificial drainage. . . . The chief requirements for the improvement of crop yields upon the different types . . . are the more extended use of stable manure, supplemented with the plowing under of green-manuring crops; the use of lime in some form, particularly in conjunction with the growing of the leguminous forage and green-manuring crops; the adoption in some sections of a crop rotation which shall provide for the alternation of grass crops with the prevalent system of grain growing; and local underdrainage on small areas of the heavier textured types. [These] soils . . . are suited to intensive tillage for the growing of market garden and truck crops upon the more sandy types, while the heavier

types constitute the best soils for the production of the staple crops to be found within the northern portion of the Atlantic Coastal Plain."

Soil survey of Habersham County, Georgia, D. D. LONG and E. C. HALL (*U. S. Dept. Agr., Advance Sheets Field Operations of the Bureau of Soils, 1913, pp. 48, fig. 1, map 1*).—This survey, made in cooperation with the Georgia State College of Agriculture, was issued December 31, 1914. It deals with an area of 181,120 acres in northeastern Georgia, which lies partly in the Blue Ridge Mountains and partly in the Piedmont Plateau, the topography ranging from rolling to mountainous. The greater part of the county is drained by the Chattahoochee River system. The soils are residual and alluvial. Twenty types of seven series and two miscellaneous types are mapped. The most important soil series in the county is the Cecil series, including six soil types of which the clay loam is the predominating type in the Piedmont section. "The agricultural progress of this county is dependent upon the maintenance of the productiveness of the soils by a greater diversification of crops, the use of crop rotations, the more extensive use of cowpeas and other legumes, the incorporation of organic matter with the soil, the keeping of more live stock upon the farms, the exercise of care in seed selection, and the proper mixing and use of fertilizers."

Soil survey of Jones County, Georgia, D. D. LONG, G. A. CRABB, ET AL. (*U. S. Dept. Agr., Advance Sheets Field Operations of the Bureau of Soils, 1913, pp. 44, fig. 1, map 1*).—This survey, made in cooperation with the Georgia State College of Agriculture, was issued December 31, 1914. It deals with an area of 256,640 acres in central Georgia, approximately 80 per cent of which lies in the Piedmont Plateau and the remainder in the Coastal Plain. The topography varies from level to undulating divides to hilly and broken areas and the drainage is performed by the Ocmulgee and Oconee river basins. The soils range from incoherent coarse sands to stiff heavy clays. Twenty-three types and three phases of thirteen series are mapped, of which nine types and the three phases are found in the Piedmont section and are said to represent the best general farm soils in the county. The Cecil soils are the most productive, with the Greenville and Orangeburg soils ranking next. It is stated that the organic matter content of practically all the soils has been depleted by the continuous growing of clean culture crops and the limited appreciation of the value of systematic crop rotation and of the growing of leguminous crops.

Soil survey of Talbot County, Georgia, R. A. WINSTON and H. W. HAWKER (*U. S. Dept. Agr., Advance Sheets Field Operations of the Bureau of Soils, 1913, pp. 40, fig. 1, map 1*).—This survey, made in cooperation with the Georgia State College of Agriculture, was issued October 20, 1914. It deals with an area of 247,680 acres in west-central Georgia, the topography of which ranges from gently rolling and undulating to very rolling and hilly. All sections of the county are adequately drained. The soils are of residual, sedimentary, and alluvial origin. Twenty-four soil types of eleven series are mapped of which the Cecil clay loam is the most important. It is stated that the soils of the county are generally in need of liming and more thorough cultivation and that terracing is necessary over the more rolling areas. "There is little recognition of the adaptation of soils to crops and no systematic rotation of crops, while the improvement and maintenance of the productiveness of the land receives but little attention."

Agriculture of Sulphur Spring Valley, Ariz., R. H. FORBES (*Arizona Sta. Bul. 72 (1913), pp. 213-224*).—This is a reprint of a chapter from a bulletin of the U. S. Geological Survey which has been previously noted (*E. S. R.*, 30, p. 18).

Soil erosion, C. T. AMES (*Mississippi Sta. Bul. 165 (1914), pp. 3-12, figs. 7*).—Experiments at the Holly Springs substation farm on the prevention of soil erosion are described.

The soil is the so-called brown loam with white impervious clay and a reddish soil resembling sandstone for subsoil. Small gullies were filled with team and plow and drag scraper, or by dynamiting. The former method was found to be the cheaper. When the gullies are much larger it is stated that satisfactory results can be had by running terraces about 75 yds. apart on the hillsides, forming a system of ponds to catch the wash soil, and which are joined together by drains to carry off the surplus water during rains. "To prevent soil washing, anything that will hold the soil in place, such as a sod of bermuda or lespedeza, is excellent; any device that will control the running water so as to make it move slowly is more or less helpful and satisfactory." The system of terracing, in which by means of rows and embankments the water is made to run more slowly, is considered the best system to use on clay soils in the South where rainfall is heavy.

The laying off and construction of terraces is also described.

Description of a wire cage used for the protection of pot experiments, J. G. LIPMAN ET AL. (*New Jersey Stas. Bul. 269 (1914), pp. 18-20, pl. 1; Rpt. 1913, pp. 484-486, pl. 1*).—Details of the construction of this cage are given.

The influence of bacteria supplied in manure on the decomposition of green manure, J. G. LIPMAN ET AL. (*New Jersey Stas. Bul. 268 (1914), pp. 22-25; Rpt. 1913, pp. 474-477*).—This is a continuation of experiments, the first five years of which were summarized in the report of the station for 1912 (E. S. R., 30, p. 325).

The results show that applications of from 1,000 to 4,000 lbs. per acre of manure gave little or no increase on plants receiving leguminous (crimson clover) green manures but produced quite different results on plats receiving nonleguminous (rye) green manures. The results in the latter case confirmed those of the previous experiments in showing that greater increases in every case resulted from small applications of manure alone than could be accounted for by the plant food supplied, thus tending to confirm the conclusion "that the bacteria conveyed in small quantities of cow manure are instrumental in bringing about a more rapid decomposition of the green manure crop, and thus make available more nitrogen for the succeeding crop."

Oxidation of manganous carbonate by microbes, M. W. BEIJERINCK (*K. Akad. Wetensch. Amsterdam, Versl. Wis en Natuurk. Afdcel., 22 (1913-14), pt. 1, pp. 415-420; also in ditto Proc. Sect. Sci., 16 (1913-14), pt. 1, pp. 397-401; abs. in Chem. Abs., 8 (1914), No. 12, p. 2211*).—The results of tests show that culture plates of agar containing about 1 per cent of manganese carbonate develop brown spots when inoculated with garden soil, indicating the oxidation of the manganese by bacteria or by some of the fungi present in the soil. Apparently very different species of fungi are capable of producing such oxidation, but all of the species are among those commonly found in humus.

Investigations into the nitrogen metabolism of soil, H. H. GREEN (*Centbl. Bakt. [etc.], 2. Abt., 41 (1914), No. 18-23, pp. 577-608; abs. in Jour. Chem. Soc. [London], 106 (1914), No. 623, I, pp. 1113, 1114*).—In a continuation and extension of work by Löhnis (E. S. R., 17, p. 1048) the author reports laboratory experiments on ammonification, nitrification, nitrogen fixation, and cyanamid decomposition in both soil and solution media carried out on samples of soil taken at approximately monthly intervals throughout the year, with particular reference to the influence of season and of soil cultivation. A slight seasonal variation is shown.

As regards the ammonification of the organic manures flesh meal, horn meal, and blood meal, the bacterial activity showed a rise from August to October, a tendency to fall or remain constant in November, and a rise to a maximum in December. This was followed by a minimum in February and a low maximum in April, and from April to July there was a slight fall, which was probably continued to a summer minimum in August. Similar results were obtained as regards nitrification, except that the spring maximum occurred in March and the decline to a summer minimum commenced in April. The slight variations in ammonification and nitrification and the December maximum are attributed to the mild character of the winter. Nitrogen fixation in 1 per cent mannite solution was low with the soil samples of August and September. Subsequently it was fairly constant except with samples taken after plowing. No definite results were obtained in the cyanamid experiments.

"Comparison of the results of manuring experiments in the field with those of laboratory tests indicates that the latter may be of considerable value in affording information as to the decomposition processes naturally occurring in soils. No difference, however, could be detected between soil from one-half of the experimental area which had received autumn cultivation and soil from the other half which remained untouched until the spring plowing, although the crop returns showed a 20 per cent superiority (in respect to nitrogen) in favor of autumn cultivation."

Solution methods were found to be equal to those in which the natural soil is employed as a medium. As regards nitrification, the solution method gave much clearer indications of seasonal variation, while the seasonal variation in ammonification was more clearly indicated in soil tests.

Nitrogen fixation by *Azotobacter* in substrata poor and rich in nitrogen, J. HANZAWA (*Centbl. Bakt. [etc.]*, 2. Abt., 41 (1914), No. 18-23, pp. 573-576; *abs. in Jour. Chem. Soc. [London]*, 106 (1914), No. 623, I, p. 1113).—Further studies along the line of those reported by Löhnis and Green (*E. S. R.*, 31, p. 120), including a test as to the value of humus as a source of energy in the nitrogen fixing process, are reported.

Mixed cultures of different strains of *Azotobacter* were found to be more effective in nitrogen fixation than the same bacteria in pure cultures, especially in aqueous solutions of mannitol.

The nitrogen of humus, even in large quantities, had no serious retarding effect on the fixation of nitrogen by pure cultures of *Azotobacter*. Small amounts of nitrates also had almost no effect, but when present in amounts corresponding to amounts of nitrogen greater than 2.5 per cent of the carbon, nitrogen fixation was retarded and finally inhibited. It is thought probable that the soil nitrogen can only in special cases, if at all, have an unfavorable effect on nitrogen fixation.

The humus of stable manure was capable of being utilized as a source of energy in nitrogen fixation, while that of green manure was not.

Mutual influence of certain crops in relation to nitrogen, K. F. KELLERMAN and R. C. WRIGHT (*Jour. Amer. Soc. Agron.*, 6 (1914), No. 4-5, pp. 204-210, figs. 4).—A brief account is given of pot experiments with legumes and nonlegumes grown singly and combined which showed "that the effect of a given crop upon two different soils may be very different, both in regard to its effect upon the total soil nitrogen and upon the nitrifying power of the two soils." There was an actual loss of soil nitrogen in the case of the nonlegumes, especially barley, over and above that utilized by the plants. With the legumes there was no such loss, but in some cases a gain. Where combinations of legumes and nonlegumes (beans and barley, and peas and barley) were grown both the legume and the nonlegume showed an appreciable gain in nitrogen.

The influence of the mechanical composition of the soil on the availability of nitrate of soda and dried blood, J. G. LIPMAN ET AL. (*New Jersey Stat. Bul.* 268 (1914), pp. 5-19, figs. 5; *Rpt.* 1913, pp. 458-471, figs. 5).—This is an account of a continuation during 1913 of experiments begun in 1911 (*E. S. R.*, 30, p. 324). The results are summarized as follows:

"When sand was mixed with shale soil (Penn loam) in varying proportions, the yield of dry matter and the percentage of nitrogen recovered from nitrate of soda were greater with 10 to 70 per cent of sand than they were with the shale soil alone, or with 80, 90, or 100 per cent of sand. The highest yield of dry matter and percentage of nitrogen recovered occurred with 50 per cent of sand.

"With dried blood the yield of dry matter and the percentage of nitrogen recovered were higher in pure sand, and in all dilutions, than with the shale soil alone.

"In no case was the yield of barley (first crop) on the check cylinders as high as the yields on the cylinders that received nitrate of soda and dried blood.

"With the residual crop of buckwheat no nitrogen was recovered from three of the series that received nitrate of soda, while comparatively small amounts were recovered from the other series. With dried blood there was some recovery in all series, the highest occurring in Series 'D' with 30 per cent of sand.

"With the first crop, barley, the highest average yield of dry matter and nitrogen was from the nitrate of soda cylinders; with the residual crop of buckwheat the highest average yield of dry matter and nitrogen was from the dried blood cylinders. With the combined crop the average yield of dry matter and nitrogen were very nearly the same for the two nitrogenous materials. For the check cylinders, the average yield of dry matter and nitrogen was slightly higher with the residual crop than with the first crop.

"The fact that the average yield of dry matter and nitrogen for the combined crops was about the same with nitrate of soda and dried blood does not necessarily lead to the conclusion that these two materials are equally good for all types of soil. In the discussion it has been shown that for the shale soil, and dilutions up to and including 70 per cent of sand, the average availability of dried blood is 70.6 when nitrate of soda is placed at 100, while, with 80 to 100 per cent of sand, the average availability of dried blood is 250 when nitrate of soda is placed at 100. From this it must be inferred that for all except very sandy soils nitrate of soda shows a higher availability than dried blood.

"The average percentage of nitrogen in the dry matter is higher for both crops with nitrate of soda than with dried blood or with the check cylinders.

"With most soils we need not expect much residual effect from moderate applications of nitrate of soda. We may expect some residual effect from dried blood in nearly all cases.

"The actual net recovery of nitrogen from the humus of the shale soils to which varying amounts of sand had been added is greater in every case than the theoretical amount as calculated from the recovery from pure shale soil. Mixing sand with heavy soils permits better aeration and drainage and results in a more complete utilization of the nitrogen in the organic matter."

[Production and consumption of Chilean nitrate] (*Assoc. Sal. Propaganda, Circ. Trimest.* 62 (1914), pp. LII+V+431).—This is a detailed report on the nitrate of soda industry of Chile for the year ended June 30, 1914. It is stated that the production of nitrate during that year was 3,165,989 short tons as compared with 3,020,083 tons the previous year. The exportation was 2,984,565 tons as compared with 2,971,412 tons the previous year. The consumption was 3,002,271 tons as compared with 2,791,336 tons the previous year.

Nitrate production, A. B. EASTERLING (*U. S. Dept. Com., Com. Rpts., No. 3 (1915), p. 48*).—The marked decrease in export duties in Chile during the past year is attributed largely to the decreased production of nitrates. The production of nitrate steadily decreased during the months of August and September, until in the latter month it was only 51 per cent of the amount produced in July. The export in September, 1914, was 107,238 tons as compared with 208,417 tons in September, 1913.

Chilean nitrate statistics, J. D. MYERS (*U. S. Dept. Com., Com. Rpts., No. 11 (1915), p. 196*).—Statistics are briefly summarized showing a pronounced decrease in number of plants and a falling off in production and exports since the beginning of the European war. It is stated that the production during the five months July to November, 1914, was 961,405 tons as compared with 1,275,093 tons during the corresponding period in 1913. Fifty-four plants were in operation in November, 1914, as against 127 in November, 1913.

Nitrate of soda in 1914 (*Chem. Trade Jour., 56 (1915), No. 1444, pp. 69, 70*).—It is stated that the production of Chilean nitrate was 2,432,320 tons in 1914 as compared with 2,739,480 tons in 1913; the exports, 1,824,760 tons in 1914 as against 2,705,820 tons in 1913; stock on hand in Chile December 31, 1,091,700 tons in 1914 as compared with 499,750 tons on the same date in 1913; cargoes in nitrate ports December 31, 1914, 38,700 tons. There was an increase of 122,000 tons in nitrate deliveries during the first half of 1914 over those of the same period of 1913. Of the 170 nitrate plants in Chile, only about 40 remained in operation at the end of 1914. "Of the year's total, 1,721,000 tons were produced in the first seven and only 711,320 tons in the succeeding five months, against 1,608,600 tons and 1,130,880 tons, respectively, in the corresponding periods in 1913."

Figures for consumption can not be given under present circumstances.

Sulphate of ammonia in 1914 (*Chem. Trade Jour., 56 (1915), No. 1444, pp. 66, 71, 72*).—Prices of ammonium sulphate were lower in 1914 than in any year since 1905, but as a result of the European war the prices rose in October and remained substantially uniform until the end of the year. The production in England in 1914 was 421,000 tons as compared with 432,000 tons in 1913. The German production is not known, but it was increasing slowly up to August, 1914. Figures are also lacking for other producing countries except the United States, in which the estimated output was 183,000 tons in 1914 as compared with 195,000 tons in 1913. Imports by the United States from July to December, 1914, were almost equal to those of the same period of 1913.

[German potash salts] (*Oil, Paint, and Drug Reporter, 87 (1915) No. 7, pp. 9, 10, 60*).—It is suggested that the strict enforcement of the German embargo on potash may be relieved by permitting shipment of potash salts after they have been subjected to some sort of denaturing process, the nature of which is not disclosed, which will preclude their use for any purpose except as fertilizer. The imports of muriate of potash by this country during the 5 months (August to December, 1914) were 25,813 tons valued at \$904,043; for the corresponding period of 1913 they were 98,781 tons valued at \$3,217,847. The corresponding figures for sulphate of potash were 8,499 tons valued at \$382,202 for 1914 and 17,896 tons valued at \$739,327 for 1913. The total imports of potash salts during the years ended December 31, 1913 and 1914, were 942,442 and 702,810 tons, respectively.

Potash supplies from Germany (*U. S. Dept. Com., Com. Rpts., No. 32 (1915), p. 529*).—It is stated that the German potash syndicate on February 1, 1915, "decided to form a commission to consider means for denaturizing potash salts so as to preclude the possibility of using them for ammunition and

military purposes and making them valuable only as fertilizers. Upon the receipt of the report of the commission the potash syndicate will confer with the Government relative to moderating the embargo on potash. . . .

"The United States imported during the fiscal year ended June 30, 1914, German potash salts for fertilizers aggregating 1,066,929 tons gross, equivalent of 256,979 tons of potash (K_2O). Importations for the six months July 1 to December 31, 1914, totaled only 184,192 tons, against 567,595 tons during the similar period of 1913, thus leaving a shortage on January 1, 1915, of 383,403 tons."

Vegetation experiments, J. G. LIPMAN ET AL. (*New Jersey Stas. Bul.* 269 (1914), pp. 12-18, pl. 1; *Rpt. 1913*, pp. 478-484, pl. 1).—Pot experiments, making comparative tests of a so-called rock potash fertilizer with other fertilizing materials and of basic slag with other phosphates are reported.

In the first case the rock potash fertilizer appears to have had a depressing effect upon the yield of dry matter. It is suggested that in view of the fact that this product is a low-grade material and must be used in comparatively large amounts it is possible that other soluble compounds are introduced in sufficient amounts to prove toxic.

In the comparison of phosphatic fertilizers the greatest increase resulted from the use of one of the basic slags, the lowest from rock phosphate. The test included comparisons of four different samples of the slag with acid phosphate, double superphosphate, sodium phosphate, and blue rock phosphate.

Comparison of magnesian and nonmagnesian limestone in rotation experiments, J. G. LIPMAN ET AL. (*New Jersey Stas. Bul.* 267 (1914), pp. 5-40, fig. 1; *Rpt. 1913*, pp. 421-457, fig. 1).—This is an account of a continuation of experiments begun in 1908, in which "four five-year rotations were carried out on 28 one-twentieth acre plats, so arranged that for each rotation there was a check plat and three plats which received nonmagnesian limestone at the rate of $\frac{1}{2}$, 1, and 2 tons per acre, and three plats which received like amounts of magnesian limestone. At the close of the rotation, samples of soil were collected from the various plats and the lime requirement for each determined.

"The results show that nearly all the plats were acid at that time. With but few exceptions, however, the acidity decreased as the amount of applied lime increased. The check plats showed the highest lime requirement.

"A comparison of the amount of nitrogen present in the surface $6\frac{3}{4}$ in. at the close of the rotation, with the amount present soon after the experiment was started, indicates a gradual loss of nitrogen. That is, with an annual application of nitrogenous fertilizers and with the use of two or more leguminous crops in the rotation, the nitrogen supply was not maintained.

"With comparatively few exceptions, both forms of lime resulted in an increased crop yield over the check plats, the most notable exceptions being the potatoes which were grown in two of the rotations.

"The yields were usually somewhat higher with the magnesian than with the nonmagnesian limestone.

"One ton of nonmagnesian limestone gave about the same increase as one-half ton, but two tons gave a decidedly greater increase than one ton.

"One ton of magnesian limestone gave, in most cases, higher yields than a half ton, but two tons did not materially increase the yield over one ton.

"In the majority of cases, the dry matter of the crops from the limed plats showed a higher percentage of nitrogen than that from the unlimed plats. This is important in the case of feeding materials and human foods, inasmuch as it means a higher protein content.

"The value of the total increased yield on the limed plats, as compared with the yield on the check plats, varies from a few dollars to \$50 or \$60 per acre

for the five years according to the crops in the rotation. In the majority of cases the increased value is more than \$20. This should be regarded as a good investment on the money expended for the limestone—that is, the cost of one application varying from 0.5 to 2 tons per acre for the entire five years."

Methods and results in vegetation experiments, J. G. LIPMAN and A. W. BLAIR (*New Jersey Stat. Bul.* 269 (1914), pp. 5-11).—Two series of pot experiments with radio-active material on barley are reported. In the first the material was used at rates of 0.1, 0.2, and 0.3 gm. per pot containing 20 lbs. of sand with which had been mixed 8 gm. of acid phosphate, 4 gm. of potassium sulphate, 5 gm. of calcium carbonate (ground limestone), 0.5 gm. of magnesium sulphate, and 0.25 gm. of iron sulphate. In the second the material was used at rates of 0.05, 0.1, and 0.15 gm. per pot containing 9 lbs. of gravelly loam soil to which had been added 4 gm. acid phosphate, 2 gm. potassium sulphate, 1 gm. nitrate of soda, and 5 gm. of ground limestone. In neither case did the radio-active material show any appreciable effect.

Utilization of the fish waste of the Pacific coast for the manufacture of fertilizer, J. W. TURRENTINE (*U. S. Dept. Agr. Bul.* 150 (1915), pp. 71, pls. 6, figs. 2).—This is a part of a general inquiry as to the fertilizer resources of the United States and their utilization. It deals with the technology and waste of fish, especially salmon, in canning, but discusses particularly the fertilizer value of the waste and methods of utilizing it for the preparation of fish scrap or of a mixed fertilizer with kelp. Brief reference is also made to the preparation of fish scrap from the herring, tuna, whale, halibut, and sardine fisheries of the Pacific coast, with analyses of dried fish scrap from sardine, whale, tuna, and dogfish fisheries.

The waste from the salmon fisheries "is variously estimated to be from 25 to 50 per cent of the original or 'round' weight of the fish." The total waste from this source on the Pacific coast is stated to be 140,210 tons valued at \$2,103,150.

The average composition of the raw waste from the mechanical dressing of "humpback" salmon was found to be nitrogen 3.02, phosphoric acid 1.59, moisture 64.6, and oil 10.43 per cent.

Of the total amount of waste only 800 tons were utilized on the Columbia River in 1913 and 15,500 tons around Puget Sound, the product being 1,630 tons of dried fish scrap and 286,000 gal. of oil. The scrap showed nitrogen varying from 7.63 to 9.49 per cent, averaging 8.7 per cent; phosphoric acid, from 5.32 to 12.08 per cent, averaging 8.31 per cent; moisture, from 3.91 to 5.36 per cent, averaging 4.97 per cent; and oil, from 8.32 to 20.02 per cent, averaging 14.32 per cent. Menhaden scrap shows as the average 8.43 per cent of nitrogen, 6.69 of phosphoric acid, 7.72 of moisture, and 6.99 of oil.

As the most efficient means of conserving the waste the author recommends as an alternative of the central rendering station, which has generally failed to meet the requirements of the situation, a small unit by-products plant of low capacity, just sufficient to treat the waste of the cannery of which it forms a part. In order that the plant may be continuously and profitably employed it is suggested that it may be utilized when the canning season is ended in preparing kelp for fertilizing purposes. A report on the fish scrap industry of the Atlantic coast has been previously noted (*E. S. R.*, 30, p. 326).

Report on commercial fertilizers, 1914, E. H. JENKINS and J. P. STREET (*Connecticut State Sta. Rpt.* 1914, pt. 2, pp. 43-112).—Analyses and valuations of 776 samples of fertilizers collected and examined during the 1914 inspection are reported, with notes on the source and character of the raw materials and miscellaneous fertilizing materials examined, the latter including sheep manure,

muck or peat, leaf mold, apple pomace, lime, limestone, and wood ashes. An analysis of sludge from the manufacture of lime-sulphur spraying solutions is appended.

Inspection of commercial fertilizers, H. D. HASKINS ET AL. (*Massachusetts Sta. Control Ser. Bul. 2 (1914), pp. 98*).—This is a detailed report of fertilizer inspection in Massachusetts during 1914, including analyses and valuations of 606 brands of mixed fertilizers, raw fertilizing materials, and lime compounds. The bulletin discusses commercial shortages in both unmixed fertilizing materials and mixed goods and the quality of plant food in the mixed goods, shows the general standing of each manufacturer's brands, and emphasizes the economy of purchasing only high-grade fertilizers.

A brief account is given of a vegetation experiment made to show the efficiency of the alkaline permanganate method as a means of indicating the activity of water-soluble organic nitrogen, and the general quality of nitrogen found in each manufacturer's product is shown. Results of field tests of certain mineral or stone meal fertilizers are briefly reported.

Commercial fertilizers, J. L. HILLS ET AL. (*Vermont Sta. Bul. 182 (1914), pp. 265-339*).—Analyses and valuations of 185 brands of fertilizers representing the output of 18 companies licensed to sell in Vermont in the season of 1913-14 are reported.

The quality of the fertilizers was fairly satisfactory, 83 per cent of the brands meeting their guaranties and the quality of the crude stock used apparently being good. All but eight of the brands containing nitrogen carried mineral as well as organic forms of nitrogen. The average selling price of the fertilizers examined was \$32.53; the average valuation, \$20.35. The high-priced brands were most economical as regards plant food obtained for the price paid. A comparison of analyses of brands for three years shows in most cases essential evenness, but in some cases considerable variation in composition.

AGRICULTURAL BOTANY.

Plant physiology, L. JOST. trans. by R. J. H. GIBSON (*Oxford: Clarendon Press, 1913, pp. 168, pl. 1*).—This is a supplement to the English translation previously noted (E. S. R., 19, p. 529) giving the alterations or additions contained in the second edition of the German original. A large amount of additional literature is also cited.

Students' handbook to accompany *Plants and Their Uses*, F. L. SARGENT (*New York: H. Holt & Co., 1914, pp. 80, figs. 17*).—This book consists of laboratory directions for studies to be conducted in connection with the author's book on *Plants and Their Uses* (E. S. R., 31, p. 425).

Experiments on hybridization with *Canna indica*, J. A. HONING (*K. Akad. Wetensch. Amsterdam, Versl. Wis en Natuurk. Afdel., 22 (1913-14), pt. 2, pp. 773-779, figs. 8; also in ditto, Proc. Sect. Sci., 16 (1913-14), pt. 2, pp. 835-841, figs. 8*).—An account is given of experiments in hybridizing two varieties of *Canna*, one of which was characterized by having green leaves, bracts, stems, etc., the other darker leaves with a red edge and dark red flowers. The behavior on the different crosses is shown and the proportions of the different hybrids suggest a segregation according to three Mendelian factors.

[Some correlation studies of hypocotyls], B. D. HALSTED ET AL. (*New Jersey Stas. Rpt. 1913, pp. 588-611, pl. 1*).—The results are given of studies on the lengths of hypocotyls and first internodes in tomatoes, peppers, and eggplants, of the influence of varietal qualities upon the length of hypocotyl and the first internode in beans, the influence of the depth of planting and hilling beans, the

effect of limited shade, varietal influence upon the length of hypocotyl and first internode, the influence of pod position of seeds upon length of hypocotyl and vigor of the plant in soy beans and pea beans, and a study of the relation of sex to the length of hypocotyl in hemp. Notes are also given on the rise of the zone of geotropic response in seedlings and of an experiment in the selection of Wilson soy beans.

A peculiar negative correlation in *Oenothera* hybrids, G. H. SHULL (*Jour. Genetics*, 4 (1914), No. 1, pp. 83-102, pls. 2, fig. 1).—Referring to difficulties in applying to *Oenothera* the rules of genetic behavior demonstrable in other groups of organisms (suggesting a hereditary mechanism in this genus fundamentally different from that which distributes the Mendelian unit characters), and noting an apparent inadequacy of the data previously recorded for discovery of the essential features of this mechanism, the author presents and discusses data obtained by himself in studying the progeny of three rosettes from unguarded but probably pure bred seeds of *Oe. rubricalyx* since 1912, both in pure strain and in crossing with other forms.

It is held that three conclusions arrived at by Gates (E. S. R., 25, p. 327), regarding the origin and genetic nature of the *Oe. rubricalyx* character are erroneous, namely, that the character represents a purely quantitative difference from *Oe. rubrinervis*, that it differs from the latter species in a single monohybrid Mendelian unit, and that the nature of a character itself, instead of the nature of the inheriting mechanism to which it is related, determines the manner of inheritance of that character.

Some fundamental morphological objections to the mutation theory of De Vries, E. C. JEFFREY (*Amer. Nat.*, 49 (1915), No. 577, pp. 5-21, figs. 7).—As a result of his studies the author concludes that the Onagraceæ are largely characterized by hybrid contamination in nature. This holds particularly for *Oenothera lamarckiana* and other species of this genus, which serve as the basis of the mutation hypothesis of De Vries. The species of *Oenothera*, the author says, are to a large extent, if not wholly, cryptohybrids, and in his investigations the objection raised by Bateson to the genetical purity of *Oe. lamarckiana* was confirmed. He considers hybridism the best explanation for the peculiar conduct of *Oe. lamarckiana* as well as other species of this genus in cultures.

The explanation of an apparent exception to Mendel's law of segregation, TINE TAMMES (*K. Akad. Wetensch. Amsterdam, Versl. Wis en Natuurk. Afdel.*, 22 (1913-14), pt. 2, pp. 846-857; also in ditto, *Proc. Sect. Sci.*, 16 (1913-14), pt. 2, pp. 1021-1031; and *Rec. Trav. Bot. Néerland.*, 11 (1914), No. 1, pp. 54-69).—The author, from experiments in crossing white and blue flowering varieties of flax, found in the second and following generations white and blue individuals that were not in agreement with the numbers expected in accordance with Mendel's law of segregation. In all cases there was a deficiency in white flowering plants. This is believed to have arisen from two causes, (1) the F_2 generation and the heterozygotes forming too small a number of seeds to yield white flowering plants, and (2) the low germinating power of the seed.

The influence of position in the pod upon the weight of the bean seed, J. A. HARRIS (*Amer. Nat.*, 49 (1915), No. 577, pp. 44-47, figs. 3).—Attention having been called to the significance of position in the pod as a factor in determining the weight of the bean seed, the author gives the results of a series of quantitative determinations of the relationship, basing his figures largely on data part of which have been previously given (E. S. R., 30, p. 433).

He claims that the percentage of ovules which develop into seeds increases from the base toward the stigmatic end of the pod. In small pods the rate of increase may be fairly regular, but in larger pods it falls off toward the stig-

matic end, where the fecundity may be even lower than it is a little farther down in the pod.

Variation of structure and color of flowers under insolation, H. E. RAWSON (*Abs. in Rpt. Brit. Assoc. Adv. Sci., 1913, pp. 711-713*).—In pursuance of work previously noted (E. S. R., 21, p. 319), the author reports studies with *nasturtium* under controlled conditions as regards illumination, employing in addition to the descendants of South African plants previously used some grown from English seed.

Very decided changes in the coloring pigments are apparently accompanied by a tendency to sterility. A correlation is suspected between color of stem and that of subsequent flowers. The occurrence of fasciation is now common, as are also modifications in the mode of inflorescence. Plants of dwarf habit have appeared and have been propagated for three generations by screening, the unscreened seedlings soon reverting to the climbing habit. By permitting cross fertilization and by limited employment of screening it is said to be now easily possible to produce slight degrees of color modification. Certain structural characters which appeared have been transmitted. The sun's altitude, diurnal or seasonal, seems to produce not only in coloration, but also in metabolism, changes which can be reproduced in other individuals.

Adjustment to light in oats, W. H. ARISZ (*K. Akad. Wetensch. Amsterdam, Versl. Wis en Natuurk. Afdeel., 22 (1913), pt. 1, pp. 536-549; also in ditto, Proc. Sect. Sci., 16 (1913-14), pt. 2, pp. 615-628*).—A study was made of oat plants grown in a dark room so regulated as to be maintained at a constant temperature and with varying illumination to determine the adjustment of the plant to different amounts of light.

The observations with bilateral illumination showed that by illuminating a plant, first on one side and then on the other, each stimulus results in a curvature, as long as there is a certain definite time intervening between the two exposures. If the illumination on the two sides should be simultaneous the tendency to curve would be neutralized and consequently the plant would grow in a straight line. Where the illumination was from all sides the growth showed a condition that is considered the summation of unilateral illuminations.

Electromotive phenomena in plants, A. D. WALLER ET AL. (*Rpt. Brit. Assoc. Adv. Sci., 1913, pp. 241-258*).—The authors, referring to the tests and conclusions reported by Balls (E. S. R., 29, p. 27) as bearing upon their own work (E. S. R., 28, p. 731), state that previously they themselves have applied the test quantitatively only in selected cases. The present report contains a detailed account of work carried out recently to serve as an indication and sample of the procedure considered necessary in working out the test as a practical method of measuring the vitality of seedlings. Their data are held to indicate a general relation between plant vitality and voltage of blaze current.

On the regulation of the transpiration of *Viscum album* and *Rhipsalis cassytha*, Z. KAMERLING (*K. Akad. Wetensch. Amsterdam, Versl. Wis en Natuurk. Afdeel., 22 (1913-14), pt. 2, pp. 821-835, pl. 1; also in ditto, Proc. Sect. Sci., 16 (1913-14), pt. 2, pp. 1008-1021, pl. 1*).—Results are given of a study on the antagonism between the guard cells of the stomata and the adjacent cells of the epidermis in these plants.

It was found that in leafy boughs or whole plants allowed to wither the amount of transpiration per unit of time remains approximately constant until the bough is dried up, or the amounts decrease uniformly until transpiration is reduced to a minimum. In the study of the two parasitic plants enumerated above it was found that when they had lost a certain proportion

of weight, varying from 1 to 4 per cent, the amount of transpiration per unit of time increased. Later when the loss in weight had increased from 6 to 10 per cent transpiration decreased.

This increase in the intensity of the transpiration is attributed to the dilation of the openings of the stomata. The author states that the dilation is probably caused by the antagonism between the guard cells and the subsidiary cells of the stomata, so that the turgor in the subsidiary cells begins to decrease sooner than in the guard cells, thus causing a stronger curvature of the guard cells and dilation of the slit of the stomata.

Bark ringing and the descent of sap, J. M. JANSE (*Ann. Jard. Bot. Buitenzorg*, 2. ser., 13 (1914), pt. 1, pp. 1-92, pls. 12).—A study has been made of the effect of bark ringing on the descent of the elaborated material in trees, particular attention being paid to the force and direction of the current. The experiments were made on horizontal branches so selected as to remove the force of gravity, and the primary and final changes, the reversal of the direction of the current, and the transportation of nonnutrient materials were studied.

In stems which were wounded by removing the bark in various ways, the cambium layer and the wound tissue were found to influence the movement of the elaborated material, and in addition to this, what the author calls a special force, the exact nature of which was not determined, was always active. This force is active in the secondary wood and assists in maintaining the current in the same general direction of the elements in the surface of the wood.

The destruction of paraffin by *Bacillus prodigiosus* and soil organisms, R. GREIG-SMITH (*Proc. Linn. Soc. N. S. Wales*, 39 (1914), pt. 3, pp. 538-541).—Certain bacteria and molds having been shown capable of utilizing certain hydrocarbons, the author has undertaken an experiment to determine whether this action may not be taken by *B. prodigiosus*. Dried blood, casein, and finally kieselguhr were coated with paraffin inoculated with *B. prodigiosus* and some soil organisms, and it was found that in all cases the paraffin was decomposed to a considerable extent, the amount being uninfluenced by the nature of the nitrogenous matter in the culture solution.

The nitrate ferment and the formation of physiological species, M. W. BEIJERINCK (*K. Akad. Wetensch. Amsterdam, Versl. Wis en Natuurk. Afdel.*, 22 (1913-14), pt. 2, pp. 1163-1170; also in ditto, *Proc. Sect. Sci.*, 16 (1913-14), pt. 2, pp. 1211-1217).—The author's studies have shown that the nitrate ferment, growing at the expense of organic food, soon loses its power of oxidizing nitrites to nitrates and changes into an apparently common saprophytic bacterium.

Summarizing the results of his investigations, it is said that the nitrate ferment represents a definite physiological species which may be kept constant in nearly pure inorganic nitrite solutions, but which, when better nourished with organic substances, passes into another physiological species which is much more constant. To the former the author gives the name *Nitribacillus oligotrophus*, and to the latter *N. polytrophus*. The first is a nitrate-forming organism while the second is not.

The study of plant enzymes, particularly with relation to oxidation, A. D. HALL, E. F. ARMSTRONG, ET AL. (*Abs. in Rpt. Brit. Assoc. Adv. Sci.*, 1913, pp. 143-145).—This summarizes the second report of the committee on the study of plant enzymes, and it lists related communications to the Royal Society, the most recent noted being apparently that of Keeble, Armstrong, and Jones (*E. S. R.*, 30, p. 129).

It is stated that during the past year progress has been made in elucidating the part played by oxidizing catalysts in the production of plant pigments. Evi-

dence accumulated favors the hypothesis that the soluble sap pigments of plants are formed by the oxidation of a colorless chromogen through the agency of an oxidase. The sap pigment may be reduced to the colorless chromogen by the agency of a reducing substance, as when the colored cell is stimulated by a hormone under conditions in which the amount of water present is at a minimum, the chromogen being reoxidized when excess of water is present in the system. Concentration of the cell sap thus shows close relation to the mechanism which controls the formation of flower color.

The work of Chodat (E. S. R., 30, p. 110) is also briefly discussed in this connection.

Some investigations in anthocyan formation, W. N. JONES (*Abs. in Rpt. Brit. Assoc. Adv. Sci., 1913, p. 713*).—This paper reviews some points thought to be of special interest considered in the communication above referred to.

It is believed that both a pigment producing mechanism and a reducing body are present in the petals, the amount of water in the cells determining which way the pigment reaction shall go. Reduction with decoloration occurs in 95 per cent alcohol, while in weak alcohol or water oxidation results in a production of pigment. Considerable quantities of reserve raw material are supposed to occur in some colored flowers which darken on fading, due, supposedly, to this reserve raw material coming into action under these circumstances.

Cytological studies on the formation of anthocyanin pigments, A. GUILLIERMOND (*Rev. Gén. Bot., 25 bis (1914), pp. 295-337, pls. 3*).—In continuation of previous studies (E. S. R., 30, p. 729), and considering the origin of anthocyanin pigments in buds, flowers, and other organs, also the formation of such pigments in leaves, the origin of the colorless phenol compounds, etc., the author states that in all cases examined the anthocyanic pigments formed resulted from mitochondrial activity, as did various colorless phenol compounds noted in most plants studied. Anthocyanin appears in general as pigment in the mitochondria, but the manner of its elaboration may be any one of several described.

Structural and functional homologies as noted between cells of vegetables and those of animals are also discussed. A large number of facts noted are said to favor the views of Combes (E. S. R., 31, p. 128) regarding the production of phenol compounds in plants as a normal and constant phenomenon and the production of anthocyanin as a modification thereof.

The question of the evolution and the physiological rôle of mitochondria, A. GUILLIERMOND (*Rev. Gén. Bot., 26 (1914), Nos. 304, pp. 129-149, figs. 7; 305, pp. 182-208, figs. 9*).—Summarizing the results of studies on the origin, development, chemical nature, intimate functions, and generalized character of mitochondria as noted in plants and animals, the author claims to have shown that mitochondria are concerned with the elaboration of the products of secretion which function chemically in the cell; that the function of the mitochondria is very general, probably the greater part of the products of secretion being elaborated therein; and that the chondriome is a constant and essential element of the functioning cell. A bibliography is appended.

Evolution of plastids and mitochondria in adult cells, A. GUILLIERMOND (*Anat. Anz., 46 (1914), No. 20-21, pp. 566-574, figs. 16*).—This is mainly a compact summary of results and conclusions already noted (see above).

Investigations in smoke injury, H. WISLICENUS (*Samml. Abhandl. Abgase u. Rauchschäden, No. 10 (1914), pp. 168, pls. 4, figs. 19*).—This is one of a series of reports under the editorship of the author on gas and smoke injury to plants, this number dealing systematically with external and internal disturbances produced by soot, smoke, and various acid fumes or gases during experiments or observations, which are discussed.

It is stated that carbon particles and insoluble salts are absolutely harmless to foliage in all its stages, but that leachings of soot, etc., as soluble salts, particularly sulphids and sulphites, cause a degree of injury to the foliage.

Pine and fir needles, while sensitive to sulphur dioxide, are not injured by sulphur trioxide in a dry medium, and in a damp atmosphere the injury is slow and somewhat limited, as is also the case of tender young foliage, which is more or less moist. Some fluorine compounds tested proved to be injurious. Light access, species, succulence, dilution with air, turgescence of guard cells, time of casting leaves, etc., modify the influence of gases on foliage. The time of greatest sensitivity appears not to be in winter or during the most abundant precipitation, but during the greatest activity of the leaves in summer.

FIELD CROPS.

Tillage and rotation experiments at Nephi, Utah, P. V. CARDON (*U. S. Dept. Agr. Bul. 157 (1915), pp. 45, figs. 21*).—This bulletin gives results of work carried on jointly by the Utah Station and this Department covering the period from 1908 to 1913, inclusive. See also a previous note (*E. S. R.*, 30, p. 135). A description of the station and of the climatic conditions is included.

A summary of the tests that deal with time and depth of plowing, cultivation of fallow, seeding, cultivation and harvesting of the crop, frequency of cropping, and diversity of crops in rotation is given as follows: "The average results for five years, 1909 to 1913, inclusive, show that spring plowing was better than fall plowing for moisture conservation, in yield of grain, and in cost of producing the crop. Spring plowing gave an average yield of 18.5 bu. per acre, as compared with 16.8 bu. for fall plowing. Owing to this difference in yield and the lower cost of producing the crop, spring plowing gave a net acre profit of \$3.03 more than fall plowing.

"The results of five years show that there was no advantage in deep plowing or subsoiling over shallow plowing so far as moisture conservation is concerned. There was no material difference in the yields obtained from plats plowed at different depths, varying from 5 to 18 in. The highest average yield was obtained from plats plowed 10 in. deep, and the lowest average yield was from the plats subsoiled 18 in. deep, while the 5-in. plowing yielded higher than the 15-in. subsoiling.

"One year's results from a test of deep fall plowing and shallow spring plowing compared with shallow fall plowing and deep spring plowing show no difference in soil moisture and but slight difference in yield.

"The results of five years' experiments on fall-plowed fallow show that the moisture of the cultivated plats remained practically the same throughout the season, while that of the uncultivated plats rapidly declined, until by fall it was reduced to a comparatively low point. It is probable that weeds and volunteer grain were important factors in this loss of moisture. The average acre yield of the cultivated plats was 17 bu., as compared with 13 bu. on the uncultivated plats.

"The results of one season on spring-plowed fallow show no difference in the moisture content of the plats cultivated or not cultivated. The yields, 11.9 and 9.5 bu. per acre, favor the noncultivated plat.

"The results of 10 years show no correlation between the time of sowing winter wheat and the yield, but the best yields have usually been obtained from plats seeded between September 1 and October 15. There was no significant difference between the average moisture content of the plats for any one or for all years. The chief problem in the time-of-seeding tests of winter wheat now seems to be a mechanical one involving some improvement of the

machinery used in seeding. It is believed that this will obviate the necessity of waiting for rain before seeding, thus permitting early seeding, which seems desirable, and allowing the crop time enough to make a fair growth before the advent of winter. Late planting is often followed by much winterkilling, which completely offsets the value of any tillage method used in preparing the land and of the quantity of moisture stored in it.

"The average result of five years' tests shows no difference in the yields of winter wheat seeded at different depths. The yields were greatly influenced by conditions at seeding time. The ordinary drilling of winter wheat has given more profitable yields than broadcasting or cross-drilling.

"The results of three years' experiments show that winter wheat sown at the rate of 4 to 5 pk. per acre is more profitable than when sown at 3 pk. per acre, the rate ordinarily used on the dry lands of the Great Basin.

"The average yields of five years favor no spring cultivation of winter wheat. The noncultivated plats yielded 17.05 bu., as compared with 15.99 bu. from those cultivated. There was no apparent difference in the moisture content of the plats. A test made in the spring of 1913 showed that 11.54 per cent of the plants were killed by one harrowing. This loss offsets all benefits that might have come from harrowing.

"The results of four years favor harvesting when the grain is in the hard-dough stage.

"Where a good stand was obtained and little winterkilling followed, winter wheat after fallow yielded more than winter wheat on continuously cropped land. This depended largely upon the season, however, and the continuously cropped plat, owing to volunteer grain, yielded as well or better than other plats in the test in seasons of much winterkilling.

"The average acre yield of winter wheat for five years was less after fallow than after corn, potatoes, or peas."

[Field crop experiments], A. M. McOMIE (*Arizona Sta. Rpt. 1913, pp. 243-250, fig. 1*).—This reports work at the dry farms and the central station for 1913. At the Prescott dry farm Moqui Indian corn is noted as being inferior to Kafir corn in yield, and fallowed land proved more productive than that continuously cropped. Feterita, white milo maize, kaoliang, Sudan grass, durra, Canada field peas, tepary beans, and Grimm and Turkestan alfalfa are noted as being new introductions. Cultural trials with many varieties of spring and winter wheat, oats, barley, rye, spelt, emmer, and millet are noted. Turkey Red wheat planted about August 20 is the only winter cereal, it is stated, to mature at the experimental dry farms. It yielded from 10 to 12 bu. per acre. At Phoenix cultural trials of wheat, barley, oats, spelt, corn, sugar beets, sugar cane, grain sorghums, forage sorghums, shallu, potatoes, and tepary beans are noted.

Report of the work done at Holly Springs branch experiment station, 1913, C. T. AMES (*Mississippi Sta. Bul. 165 (1914), pp. 13-21, 26, 32, figs. 4*).—Tests with 26 varieties of corn gave yields that ranged from 30.5 to 57.8 bu. per acre; 28 varieties of cotton yielded from 352 to 671 lbs. per acre of lint cotton, or from 1,169 lbs. to 1,843 lbs. of seed cotton. Length of staple ranged from $\frac{1}{2}$ to $1\frac{5}{8}$ inches. Fertilizer tests indicated that the soil was deficient in both lime and phosphorus, as basic slag produced the best yields of lint cotton in fertilizer tests.

Some conclusions regarding the results of fertilizer tests with cotton covering a period from 1906 to 1913, inclusive, are given as follows:

"The use of both nitrogen and phosphorus, either alone or in combination, has given very satisfactory results.

"Phosphorus hastens maturity. Valley land that is slow in maturing a crop can be very greatly benefited by its use.

"The use of potash, either alone or in combination with other elements, appears to be unnecessary in these soils.

"On thin uplands, the use of an equal mixture of acid phosphate and cotton-seed meal, at the rate of 200 to 300 lbs. per acre, gives very satisfactory results, and has done so for the past 8 years. Two hundred lbs. of this mixture has increased the yield of seed cotton in many instances over 500 lbs. per year. On the more fertile soils the quantity of phosphorus may be increased to advantage.

"Acid phosphate alone, 200 to 300 lbs. per acre, can be used to profit after leguminous crops."

It is noted that in fertilizer and lime tests with cowpeas "one application of lime, at the rate of 2 tons of crushed stone or 1 ton of air-slaked lime per acre, will increase the yield of most legumes each year for several years. Lime will give better results when used under leguminous crops; however, on these soils almost any crop will respond to the use of lime. Ten tons of lime per acre for the contents of the first 7 in. of a soil is considered the minimum amount of lime for a maximum crop production, whereas these soils contain only about 4,500 lbs."

Yields of tests of 15 varieties of cowpeas and 6 varieties of soy beans are given.

Cultural methods are noted for alfalfa and crimson clover. Cultural methods for Lespedeza clover are described with reference to beneficial results obtained from the use of acid phosphate. Cultural and storage methods for use in the production of sweet potatoes are also given.

Report of the department of farm crops, I. L. OWEN ET AL. (*New Jersey Stas. Rpt. 1913, pp. 391-417, pl. 1, fig. 1*).—In this report, continuing previous work (E. S. R., 30, p. 333) are given the costs of production of various field crops as derived from carefully kept records in 1913 on the station farms.

Records of a 9-acre field of alfalfa show the average cost of producing hay per acre to have been \$19.17, the average cost per ton, \$5.50, and the average yield per acre, 3.48 tons. Similar items of a 10-acre timothy field are given as \$34.05, \$8.58, and 2.98 tons; of a 14½-acre field of oats and pea hay, \$15.80, \$6.83, and 1.66 tons; of a 19-acre field of alfalfa, \$12.56, \$5.03, and 2.5 tons; of a 10-acre field of oat and pea hay, \$14.50, \$9.67, and 1.5 tons; of a 6-acre field of silage, \$28.88, \$3.32, and 8.68 tons; and of a 24-acre field of silage corn, \$29.36, \$3.73, and 7.87 tons.

The total cost of seeding a 14½-acre field of timothy and clover is given as \$23.10 per acre. The total labor cost of producing rye and vetch on 6 acres is given as \$98.93 and the total income as \$296.50. The average cost per acre of a 3½-acre field of rye straw and soy beans is given as \$6.15, the cost per ton as \$3.40, and the yield as 1.8 tons.

The total value of the crop from a 13-acre field of soy beans for seed is given as \$424 and the cost of production as \$207.32. The total cost of seeding a 10-acre field of alfalfa is given as \$168.42. Data are also recorded for buckwheat.

It is noted that the use of 16 per cent acid phosphate in mixing fertilizers in the place of 14 per cent acid phosphate caused the mixture to cake in the spreaders and made it necessary to distribute by hand.

[Field crops experiments, 1905], O. A. THOMPSON and J. H. SHEPPERD (*North Dakota Sta., Rpt. Edgeley Substa. 1905, pp. 5-16, pl. 1*).—These pages record results of variety tests with wheat, oats, barley, emmer, flax, corn,

millet, and potatoes; cultural experiments with wheat, brome and slender wheat grass; and crop rotations carried on during 1905, in cooperation with this Department.

[Field crops experiments, 1906], O. A. THOMPSON and J. H. SHEPPERD (*North Dakota Sta., Rpt. Edgeley Substa. 1906, pp. 12-26, pls. 3*).—This reports the continuation of variety tests with wheat, oats, barley, emmer, einkorn, and potatoes, and tests of rotation, humus conservation, and moisture conservation methods, carried on in cooperation with this Department in 1906.

[Field crops experiments, 1907], O. A. THOMPSON and J. H. SHEPPERD (*North Dakota Sta., Rpt. Edgeley Substa. 1907, pp. 10-20, 23-37, pls. 6*).—This outlines and describes cultural tests with cereals, slender wheat grass, brome grass, alfalfa, and clover, crop rotations, and moisture and humus conservation methods carried out in cooperation with this Department in 1907. Yields are given in variety tests of wheat, oats, barley, and rye.

[Field crops experiments, 1908-9], O. A. THOMPSON and J. H. SHEPPERD (*North Dakota Sta., Rpt. Edgeley Substa. 1909, pp. 17-52*).—This gives results of variety tests with wheat, oats, barley, rye, potatoes, rutabagas, carrots, mangels, sugar beets, corn, millet, rates of seeding millet, wheat, oats, and barley, and cultivation and variety tests with alfalfa, carried on in cooperation with this Department in 1908 and 1909.

[Field crops experiments, 1910], O. A. THOMPSON and J. H. SHEPPERD (*North Dakota Sta., Rpt. Edgeley Substa. 1910, pp. 14-44, figs. 10*).—This gives results of cultural tests with wheat, oats, barley, rye, brome grass, timothy, red, alsike, crimson, and white clover, bluegrass, Canada peas, and Dwarf Essex rape, and variety tests with wheat, oats, barley, potatoes, beets, sugar beets, mangels, carrots, rutabagas, corn, and alfalfa carried on in cooperation with this Department.

[Field crops experiments, 1911-12], O. A. THOMPSON and J. H. SHEPPERD (*North Dakota Sta., Rpt. Edgeley Substa. 1912, pp. 8, 9, 12-42, 50*).—This gives results of work with cultivation methods, cultural tests with wheat, oats, barley, rye, brome grass, slender wheat grass, potatoes, red, alsike, and crimson clover, timothy, Canada peas, and Dwarf Essex rape, a test of formaldehyde for potatoes, and variety tests with wheat, barley, oats, potatoes, beets, mangels, sugar beets, carrots, rutabagas, flax, corn, millet, and alfalfa carried on in cooperation with this Department.

[Field crops experiments, 1913], O. A. THOMPSON and J. H. SHEPPERD (*North Dakota Sta., Rpt. Edgeley Substa. 1913, pp. 7-19*).—This describes and gives results of some of the work carried on in cooperation with this Department.

In variety tests with wheat it is noted that the highest yields of grain produced in each class were 28.3 bu. for the durums, 30.6 bu. for the fives, and 26.9 bu. per acre for the bluestems. Flax yielded from 52 to 54 bu. per acre.

The results of a test of rate of seeding with wheat, oats, and barley, ranging from 2 to 11 pk. per acre, covering the 5 years from 1908-1913, inclusive, showed that "in 1913 the heavier yields conform very closely to the heavier rates of seeding, while in other seasons, with the exception of oats, the heavier yields are associated with an intermediate rate." Dynamiting and subsoiling with wheat, oats, and barley gave doubtful results in 1912 and 1913.

The results of different methods of preparing land for cereals show, "in 1913, the early fall plowed land produced larger yields than any of the other methods employed. The spring plowed land comes second in the matter of production and the late fall plowed third. When the four-year average is considered, there appears to be no advantage obtained from packing the land either in the fall or in the spring. A comparison of the average yield of all

the fall methods of tillage with the average of all the spring methods shows a difference of 4.9 bu. per acre in favor of the latter."

Two cropping systems are outlined, one adapted to live stock farming and one to grain farming, and a fertilizer experiment is also outlined.

Average yields of wheat and oats grown with different cultural methods are given. The averages showed that "wheat on fallowed land stands first with a yield of 21.8 bu. per acre; second, on disked corn ground with a yield of 19.1 bu.; third, on all humus conservation plats with a yield of 18.8 bu; fourth, where green manure is plowed down with a yield of 18.1 bu.; fifth, on spring plowed land with a yield of 17.3 bu.; sixth, on fall plowed land with a yield of 16.6 bu. per acre. Comparing the average of the oat yields under the different treatments, we have the oats yielding first on the fallow land with a yield of 41.3 bu. per acre; second, on the green manure plats with a yield of 35.1 bu.; third, on the disked corn ground with a yield of 34.5 bu.; fourth, on spring plowed land with a yield of 34.1 bu.; fifth, on the all-humus conservation plats with a yield of 33.9 bu.; sixth, on the fall plowing with a yield of 31.4 bu. per acre."

[Field crops experiments, 1909], E. D. STEWART and J. H. SHEPPERD (*North Dakota Sta., Rpt. Langdon Substa. 1909, pp. 7-11*).—These pages report variety tests of wheat, oats, and barley, and cultural experiments with clover, flax, millet, peas and oats, and potatoes.

[Field crops experiments, 1910], E. D. STEWART and J. H. SHEPPERD (*North Dakota Sta., Rpt. Langdon Substa. 1910, pp. 9-19, figs. 2*).—These pages report crop rotation trials, variety tests with alfalfa, wheat, oats, and barley, and cultural experiments with brome grass, timothy, millet, corn, peas and oats, Canada peas, flax, rye, emmer, and potatoes.

As a result of the study of the root system of wheat it is stated that plants that were about 24 in. high had roots to the depth of 4 ft. 4 in., and that 75 per cent of the roots reached a depth of 2 ft. or more.

As a result of experimenting upon depth of plowing, it is stated that "close observation during the entire period of growth failed to show any difference except that there was slightly more straw on the spring plowed land. Fall plowing 5 to 6 in. deep gave a yield of 4.2 bu. per acre; spring plowing 5 to 6 in. deep, 3.4 bu. per acre; and deep fall plowing 12 in. deep, 3.33 bu. per acre. The low yields are the result of the dry season."

[Field crops experiments, 1911], E. D. STEWART and J. H. SHEPPERD (*North Dakota Sta., Rpt. Langdon Substa. 1911, pp. 9-29, figs. 3*).—These pages report cultural tests with clover, alfalfa, corn, vetch, peas, timothy, millet, brome grass, redtop, western rye grass, flax, spring and winter rye, emmer, wheat, oats, and potatoes, and variety tests with alfalfa, corn, millet, wheat, oats, barley, and potatoes. Notes are given on a 5-year and 6-year crop rotation.

In regard to soil packing and fallowing for wheat, it is noted that "upon the 5 to 6-in. plowing the ground not packed before seeding gave a yield of 1.07 bu. more than the packed ground. Upon the 12-in. plowing the ground packed gave a yield of 1.06 bu. more than the unpacked ground. Upon the spring plowing there was an increase of 1 bu. in yield on the packed land. . . . Where fallow ground is free from weeds a better yield can be obtained in this locality by the use of the ordinary peg-tooth harrow than where the ground is disked. Disking seems to loosen the ground more than is necessary to secure a good seed bed."

Experiments in different depths of plowing for spring wheat showed the yield of grain upon 5 to 6-in. fall plowing to be the best and that upon the spring plowing 3 to 4-in. was the poorest. On fall plowing to the depth of 12 in. "the straw grew taller and heavier and from the general appearance of the

field looked better during the growing season, yet when threshing was done the grade was considerably poorer, as the grain was shriveled and affected badly by rust."

With oats fall plowing to a depth of 5 to 6 in. gave a yield of 3.63 bu. more than upon the 12-in. fall plowing, and 11.75 bu. per acre more than upon the 3 to 4-in. spring plowing. Similar results are noted with barley.

[Field crops experiments, 1912], E. D. STEWART and J. H. SHEPPERD (*North Dakota Sta., Rpt. Langdon Substa. 1912, pp. 7-32, figs. 4*).—This gives results of variety tests with alfalfa, wheat, oats, barley, potatoes, and cultural trials with corn, clovers, peas, peas and oats, vetch, timothy, millet, flax, winter and spring rye, emmer, winter wheat, oats, and potatoes, with notes upon the 5-year and a 6-year rotation.

In studying the root system of wheat grown on land fall plowed 3 to 4 in., 5 to 6 in., and 12 in. deep "it was found that 50 per cent of the roots grew to the depth of 2 ft. and over, and many roots were traced down to the depth of 6 ft. in the 3 different depths of plowing. It was also found that there was little or no difference in the root system in the different depths of plowing."

[Field crops experiments, 1913], E. D. STEWART and J. H. SHEPPERD (*North Dakota Sta., Rpt. Langdon Substa. 1913, pp. 8-26, figs. 3*).—This reports variety tests of wheat, oats, barley, and potatoes, and on cultural experiments with corn, peas, alfalfa, clover, flax, winter wheat, winter rye, early and late seeding of wheat, rates of seeding wheat upon corn ground and upon timothy sod, methods of treating corn stubble to be sowed to wheat, different rates of seeding oats and barley, and different depths of plowing for wheat, oats, barley, timothy, and corn, and notes on rotations.

Summary of results [in] field husbandry, 1913, O. C. WHITE ET AL. (*Canada Expt. Farms Bul. 75 (1914), pp. 43*).—This bulletin gives in a summarized form the more important of the season's results secured from crop production and field experimental work as carried on at the several experimental farms in continuation of previous work (E. S. R., 32, p. 431).

Numerous crop rotations are described. The costs of operations per acre of the several rotations at the central station for 1913 are given as ranging from \$17.08 to \$21.83, and the average profits for eight years preceding 1912 as ranging from \$8.15 to \$10.08 per acre. The cost of production for oats is given as 30.8 cts. per bushel, for hay (first year) \$4.06 per ton, hay (second year) \$4.12 per ton, turnips \$1.86 per ton, and corn \$1.72 per ton.

In regard to the use of barnyard manure and commercial fertilizers in these rotations, it is noted that "the five years' results . . . show a distinct advantage of barnyard manure alone over commercial fertilizer alone for this soil, but point to the possibility of combining the two to good advantage when barnyard manure is scarce or high in price."

The eradication of couch (twitch or quack) grass by the use of the spring tooth and smoothing harrows is noted.

The cost of production per bushel of the rotation crops at Nappan, Nova Scotia, are given as follows: Turnips 5.94 cts., mangels 7.68 cts., potatoes 13.13 cts., oats 28.9 cts., wheat 48.9 cts., barley 40.8 cts., and silage corn \$3.10 per ton.

At Cap Rouge, Quebec, the results of different rates of seeding corn (Long-fellow) for silage during three years are given as follows: In rows 8 by 42 in., 9 tons 1,094 lbs. per acre; 8 by 48 in., 8 tons 1,754 lbs.; in hills 36 by 36 in., 5 tons 1,398 lbs.; and 42 by 42 in., 5 tons 1,364 lbs.

At Indian Head, Saskatchewan, the profit per acre on land in a 3-year rotation of summer fallow, wheat, and wheat is given as \$9.61; of a 6-year rotation of summer fallow, wheat, wheat, oats (seeded down with western rye

grass and alfalfa), hay, and pasture \$12.08; of an 8-year rotation of summer fallow, wheat, wheat, summer fallow, corn, barley (seeded down with western rye grass and alfalfa), hay, and pasture \$8.32; and of a 9-year rotation of summer fallow, roots, wheat, oats, summer fallow, wheat, oats (seeded down with western rye grass and alfalfa), hay, and pasture \$9.12.

In regard to a 3-, 6-, 8-, and 9-year rotation at Rosthern, Saskatchewan, it is noted that "land worked under a rotation including grains and hay gives a greater profit per acre than where wheat alone is grown, and this is emphasized in a season of early frosts; that a hoed crop in the rotation increases the cost of operation per acre, but very much more increases the profit per acre as well as the yield of the succeeding grain crops."

In studying the relative value of summer fallow manured, summer fallow without manure, green crops of peas, and vetches plowed under it is noted that the plowing under of a green crop evidently left the ground too dry for any great benefit to be derived by the crop of the succeeding year, but showed an advantage over bare fallow in the second succeeding crop.

The yields of hay in 1913 at Scott, Saskatchewan, as results of various methods of seeding 10 lbs. each of western rye grass and red clover seed per acre, are given as follows: With wheat after summer fallow, 2 tons 400 lbs.; alone after summer fallow, 2 tons 1,200 lbs.; with wheat after roots, 2 tons 800 lbs.; alone after roots, 2 tons 680 lbs.; with wheat after wheat, 1 ton 1,240 lbs.; alone after wheat, 1 ton 1,160 lbs.; with oats after wheat, 1,720 lbs.; alone after wheat on manured land, 1 ton 80 lbs.; with wheat after two successive crops of wheat, 1 ton 820 lbs.; alone after oats preceded by wheat, 1 ton 400 lbs.; with wheat after wheat preceded by a hoed crop, 1 ton 1,860 lbs.

In regard to the experimental work at Lethbridge, Alberta, it is noted that "on the dry land the yields of hay were very light. Brome grass produced only 1,580 lbs., and western rye grass 1,160 lbs. per acre. Alfalfa sown broadcast yielded only 1,481 lbs. per acre whereas alfalfa sown in rows yielded about double this amount. . . .

"Wheat following corn yielded as well as wheat after summer fallow, and much better than wheat following turnips. The latter difference is no doubt due to the fact that the roots made considerable growth in the fall, thereby using up moisture, whereas the corn ceased growth with the first frost. A good profit was obtained from alfalfa seed when the crop was planted in rows and intertilled. Heavy yields of oats and peas, grown for feed, were obtained when sown on summer fallow. With irrigation, the yield of spring wheat was over 52 bu. per acre, following potatoes. With irrigation, potatoes planted on alfalfa sod gave a yield of 635 bu. 30 lbs. per acre. . . .

"Our results to date indicate the following rates of seed per acre to be the best: Winter wheat, nonirrigated, 60 lbs.; spring wheat, nonirrigated, 75 lbs.; oats, nonirrigated, 60 to 75 lbs.; barley, nonirrigated, 75 to 90 lbs.; spring wheat, irrigated, 90 to 105 lbs.; and oats, irrigated, 75 to 90 lbs."

At Lacombe, Alberta, trials of graded seed showed that "wheat fanned three times, under strong wind, yielded 35 bu. 11 lbs. per acre, wheat fanned once yielded 26 bu. 50 lbs., and wheat not fanned, 24 bu. . . .

"The deep working of the land in the summer fallow year did not appear to give any special results on the first succeeding crop (wheat) but influenced favorably the second crop (oats). In the breaking out of sod, plowing at a depth of 5 in. gave better results than at 3 or 4 in. This practice also proved superior, this year, to breaking sod 3 in. and plowing the wheat stubble 6 in. for the following oat crop."

In summer fallow treatment it is noted that "it is of advantage to plow summer fallow but once, that deep plowing gives better results than shallow plowing, and that working or plowing the stubble land in the fall previous to the summer fallow does not always result in increased yields."

Notes are given on the first year's trials at Agassiz, British Columbia, with nitrate of soda *v.* nitrate of lime for mangels, commercial fertilizer alone *v.* commercial fertilizer together with barnyard manure, spring application *v.* winter application of fresh manure, and winter application of manure (fresh) *v.* spring application (stack).

Summary of results [with] forage plants, 1913, M. O. MALTE ET AL. (*Canada Expt. Farms Bul.* 76 (1914), pp. 32).—This bulletin gives summarized results of the more important experiments with forage crops conducted at the several experimental farms during 1913. Brief notes are presented regarding variety tests of turnips, mangels, carrots, corn, and sugar beets, and preliminary work in breeding alfalfa, clovers, timothy, orchard grass, western rye grass, and wild grasses, etc.

[Effect of frost on forage and other plants], J. J. THORNBEE (*Arizona Sta. Rpt.* 1913, pp. 251-255).—This notes the serious injury to the native and cultivated forage and other plants caused by the unusually low temperature of the winter of 1912-13.

[Alfalfa and wheat breeding experiments], G. F. FREEMAN and J. C. T. UPHOF (*Arizona Sta. Rpt.* 1913, pp. 257-261, 263-265).—This gives further observations regarding investigations with alfalfa (E. S. R., 31, p. 629). It is noted that the studies of 144 pure races of alfalfa "give promise of affording (a) pure races of alfalfa of the Peruvian type, which heretofore has shown itself so productive in mass cultures; (b) improved strains of the rapidly growing Mediterranean alfalfa for use in short rotations; and (c) strains high in both leafiness and productivity, which will be of value to the dairy industry."

The points involved in a study to increase the water efficiency of alfalfa are noted as being rapidity of growth, rate of transpiration per unit of surface exposed, ratio of transpiring surface to total dry matter produced, the distribution and length of root system, osmotic density of cell sap, ability of the plant to become dormant in seasons of water famine. The study has thus far shown that some strains will regularly mature a crop from five to seven days earlier than others under the same conditions; that certain strains or varieties under identical conditions regularly give off more water than others per unit of green weight or of leaf surface exposed; that the percentage of leaves in different pure races varies widely; that the rate of growth does not depend upon the amount of water transpired; that there is usually a minus correlation between yield and percentage of leaves; and that varieties of alfalfa differ markedly in their ability to become more or less dormant during seasons of extreme heat or water famine.

Breeding and selection work in progress with Algerian and domestic hard wheat varieties is briefly described. Yields ranging from 21 to 67 bu. per acre are recorded.

Alfalfa in the Southwest, G. F. FREEMAN (*Arizona Sta. Bul.* 73 (1914), pp. 233-320, pls. 2, figs. 19).—This bulletin contains information gathered from several sources upon the culture, harvesting, storage, uses, and enemies of alfalfa, with special reference to Arizona conditions.

The discussion includes acid and alkaline soils, methods of irrigation, the alfalfa caterpillar, green alfalfa hopper, grasshoppers, harvester ant, variegated cutworm, alfalfa weevil, brown root rot, leaf spot, rust, downy mildew,

crown gall, Phoma disease, stem rot, dodder, and such weeds as Johnson grass, Bermuda grass, wall barley, water grasses, dock and canaigre, pigweed, sour clover, and bur clover.

The bulletin terminates in tables taken from several sources, showing the composition of alfalfa and the commercial grades of the hay.

Hairy vetch for the cotton belt, C. V. PIPER (*U. S. Dept. Agr., Office Sec. Spec. [Circ.], 1914, Dec. 15, pp. 4, fig. 1*).—Brief notes on methods of production.

Winter oats in the cotton belt, C. W. WARBURTON (*U. S. Dept. Agr., Office Sec. Spec. [Circ.], 1914, Nov. 21, pp. 4*).—Brief notes on methods of production.

Rape as a forage crop in the cotton belt, C. V. PIPER (*U. S. Dept. Agr., Office Sec. Spec. [Circ.], 1914, Dec. 15, pp. 3*).—Brief notes on methods of production and uses.

Rye in the cotton belt, C. E. LEIGHTY (*U. S. Dept. Agr., Office Sec. Spec. [Circ.], 1914, Dec. 2, pp. 4*).—Brief notes on methods of production.

Sorghum for forage in the cotton belt, H. N. VINALL (*U. S. Dept. Agr., Office Sec. Spec. [Circ.], 1914, Dec. 23, pp. 4*).—Brief notes on methods of production and uses of sorghum and Sudan grass.

Soy beans in the cotton belt, W. J. MORSE (*U. S. Dept. Agr., Office Sec. Spec. [Circ.], 1915, Jan. 12, pp. 6*).—This discusses methods of production and uses.

Trials with sweet clover as a field crop in South Dakota, A. N. HUME and M. CHAMPLIN (*South Dakota Sta. Bul. 151 (1914), pp. 3-20, figs. 6*).—This bulletin gives a brief description of sweet clover, the possibilities in its use, and results of tests in South Dakota. Sweet clover sown in corn in August is noted as yielding 3.6 tons of hay in two cuttings the next year and 0.8 tons of hay and a seed crop of 5.9 bu. per acre the second year. Sweet clover sown in April in fall wheat is noted as being successful.

Letters are quoted from farmers of South Dakota who have produced sweet clover successfully. Data of rainfall for varying periods from 1905 for four localities of the State are given.

Winter wheat in the cotton belt, C. E. LEIGHTY (*U. S. Dept. Agr., Office Sec. Spec. [Circ.], 1914, Nov. 21, pp. 6*).—Brief notes on methods of production.

Winter wheat, A. ATKINSON and J. B. NELSON (*Montana Sta. Bul. 100 (1914), pp. 147-160, figs. 4*).—This bulletin notes Turkey Red and Kharkov varieties of wheat as being most commonly grown in Montana. In several years' tests on demonstration farms the former averaged 25.6 bu. per acre. As a 5-year average at the Fergus County substation the Kharkov variety is noted as yielding 35.2 bu. and Turkey red 32.8 bu. per acre. In rate-of-seeding tests, from 3 to 4 pk. are noted as giving the best results. The time-of-seeding tests showed that August and early September seedings were the most satisfactory.

"Harrowing winter wheat in the spring reduced the yield in nearly every case. Rolling in the spring increased the yield in the tests conducted. Spring harrowing of winter wheat reduced the stand 19.4 per cent when compared with the wheat not harrowed. The unharrowed wheat produced an average of 4.5 heads per plant and the harrowed wheat 4.3 heads per plant. Wheat drilled in between the rows of standing corn gave a fair yield, and it is probable that this method of seeding will be very generally adopted as the area devoted to corn-growing increases."

The continuous growing of wheat and rye, 1913, J. G. LIPMAN ET AL. (*New Jersey Stas. Bul. 268 (1914), pp. 19-21, pl. 1; Rpt. 1913, pp. 471-473, pl. 1*).—This reports the continuation of work previously noted (*E. S. R., 30, p. 325*). The plan of the experiment has not been modified, and the results are similar to those of 1911 and 1912, showing that even a leguminous crop which has not attained full development may add enough humus and nitrogen to the soil to

more than double the yield as compared with plats which have grown no legume.

Permanent pastures for the cotton belt, L. CARRIER (*U. S. Dept. Agr., Office Sec. Spec. [Circ.], 1914, Dec. 23, pp. 4*).—Brief notes on the methods of production of Bermuda grass, Lespedeza, bur, and white clover, carpet grass, Italian rye grass, redbud, orchard grass, and hairy vetch.

Report of the seed analyst, J. P. HELYAR and R. SCHMIDT (*New Jersey Stas. Rpt. 1913, pp. 369-375*).—This contains brief notes on scope of the work, equipment of the laboratory, and data showing results of the analyses of 486 samples of seeds.

HORTICULTURE.

Report of the horticulturist, M. A. BLAKE, A. J. FARLEY, and C. H. CONNORS (*New Jersey Stas. Rpt. 1913, pp. 89-173, pls. 14*).—Data are given on a survey of the peach industry within a radius of six miles of the Vineland experimental orchard (*E. S. R., 30, p. 344*). The influence of the control of the brown rot and peach scab and the successful shipping of the first crop of peaches from the experimental orchard in 1910 appears to have greatly stimulated the peach industry as a whole, for the total plantings for the last three years are in excess of 76,000 trees as compared with about 20,000 trees for the previous three years. Most of the orchards are receiving good care in cultivation and fertilization. Of the varieties planted the Elberta ranks first in number, followed by Carman, Champion, Belle of Georgia, and Ray. A brief account is given of the work of the past season in the Vineland orchard, including an outline of spraying practice. Orchard heaters were tested during the blooming period and the temperatures kept above freezing, but high winds and wet weather greatly interfered with pollination.

During the spring of 1913 a study was made by C. Miller of the viability of the pollen of the peach, nectarine, currant, and gooseberry. The results and observations of this study are briefly recorded here. A preliminary test of various solutions in which to germinate pollen resulted in the selection of a 20 per cent sugar and gelatin solution, and also a 20 per cent sugar solution, the former being most satisfactory for the germination of peach pollen.

A study of the viability was made with pollen gathered fresh from the trees just previous to each test. Ripe pollen which would germinate was found upon seven varieties of peaches and three of nectarines from April 9 to 21, or a period of thirteen days. There were many periods of wet weather during the blooming period, and it was noted that ripe, yellow pollen grains upon the anthers turned to a grayish white and had a leached appearance following such wet conditions. All such grains failed to germinate when tested in the laboratory. Some varieties were found to be more capable of germinating in dilute sugar solutions than others. It is suggested that such varieties should be at an advantage during wet blooming periods.

Viability tests were also made of peach and nectarine pollen taken from blooming twigs kept in the laboratory. Very little pollen was in condition for germination until April 7. Fairly constant results were secured with most varieties from April 9 to 17, when a rapid falling off in the ability of the pollen to germinate occurred with two exceptions—Belle of Georgia pollen gave a 49 per cent germination on April 26, having yielded pollen capable of germinating over a period of 22 days, and Carman gave a 43 per cent germination upon April 22.

Pollen secured from Maule Early twigs germinated in sugar solution for a period of only nine days. Some pollen was collected and placed in a bottle,

which was sealed and placed upon a shelf in the laboratory. Such pollen gave a good percentage of germination ten days after pollen of the same variety had failed to germinate when kept exposed to the air.

In addition to the considerable difference in varieties as to the length of time the pollen will remain viable, the authors conclude that there is variation between the pollen from trees of the same variety occasioned by factors which affect the development of the flowers.

Somewhat similar viability tests were conducted with the pollen of the gooseberry and currant. The pollen of three varieties of gooseberries commenced to germinate well on April 21 and continued to do so for a period of nine days. A small percentage of pollen showed its ability to germinate as late as May 3. The results of the tests with currants show that ripe, viable pollen occurred upon the plants from about April 21 to May 12 to 14, depending upon the variety, or a period of from 21 to 23 days.

Some crossing work was also attempted with gooseberries and currants. The number of crosses was small, but the results apparently indicate that the Wilder, Pomona, and Red Cross varieties of currants are self-fertile.

Tables are given showing the blooming dates for the seasons of 1912 and 1913 of the various kinds and varieties of fruits grown on the college farm, together with a discussion of weather conditions at the actual blooming period of certain varieties of fruits and the effect of the weather upon the flowers and fruit.

The results of dynamiting for tree planting, based upon all of the tests made at the station during the past two years, indicate that there is a greater development of branch and twig at the close of the first season's growth for peaches, but only a slightly greater development for apples where the trees are planted with dynamite. See also a previous note (E. S. R., 29, p. 339). This development has not been accompanied by a corresponding increase in the circumference of the trunks. Both apple and peach trees planted with dynamite have developed a deeper and stronger root system than trees planted in the usual manner. In all the tests made, both with apples and peaches, the percentage of trees living through the first season was practically the same, whether dynamite was used or not. This is attributed to a previous thorough preparation of the soil before planting. The results of the tests as a whole indicate thus far that the advantage in twig growth the first season shown by the trees planted by the use of dynamite is not maintained the succeeding year.

Results are given of experiments conducted with American Beauty roses in a commercial greenhouse during the seasons of 1910 and 1911. They indicate that the American Beauty rose is markedly affected by the amount of light which it receives in the greenhouse. All other conditions being equal the monthly yields of this rose are reduced during the dull months of the year. Experiments show that even in modern well-lighted rose houses plants near the south side of a bench are more productive than plants near the north side. The general vigor of the plants is not greatly reduced during the dull period. Individual plants favored by extra light are more productive even in bright months, such as May and June. Too close planting is likely to result in low yields from the less favored plants.

A paper dealing with a study made by C. H. Connors relative to the multiplication of floral parts in the carnation, previously noted (E. S. R., 30, p. 644), is here given.

Soil, temperature, and moisture studies with carnation and rose soils were conducted in the station greenhouse by J. S. Obecny, largely with a view to determining the variable factors to be considered in investigations with plants under greenhouse conditions. In the data and observations recorded, the follow-

ing phases are considered: The relation of fineness of soil division, various kinds of organic matter, sand, and bench construction to maximum moisture; the relation of age to the water-holding capacity of soils; and the relation of maximum moisture to optimum moisture. In the discussion of soil temperatures, consideration is given to the relation of air temperature to soil temperature, the effect of location of heating pipes on soil temperatures, the effects of sun, ventilation, and direction of wind on soil temperatures, and the relation of moisture to soil temperatures.

The results of greenhouse fumigation with potassium cyanid are reported. Fifteen fumigations were conducted in rose and carnation houses with 98 per cent potassium cyanid, used at the rate of five-eighths of an ounce to 1,000 cu. ft. of greenhouse space. The temperatures inside the rose houses varied from 62 to 80° F., inside the carnation houses from 54 to 60° F., and the length of time for each fumigation varied from 16 to 17 minutes. The result in the destruction of aphids in the rose houses were good in all cases but in some instances slight injury to the foliage resulted. Fumigations at the above noted strength and duration failed to destroy many of the aphids in the carnation houses. Subsequent experiments indicated that fumigations for the destruction of green aphids are not likely to prove successful where the temperature of the greenhouse is 60° F. or below, and where the amount of cyanid used is at the rate of three-fourths of an ounce to 1,000 cu. ft. of space unless the time of fumigation is prolonged to exceed 30 minutes, and even this may not bring success.

A peculiar form of injury to carnations was observed after one fumigation. This appeared in the form of a light ring or band upon the calyx. The injury occurred upon small immature buds and also upon buds that were opening. It was so slight, however, that it did not appear to affect the quality of the flower. Observations upon a disease of carnations are noted on page 549.

In order to control red spider upon American Beauty roses, a spray, consisting of a mixture of fish-oil soap and blackleaf 40, was used. This was used at the rate of 130 gm. of fish-oil soap and 3 gal. of water to which was added 1 fluid ounce of blackleaf 40 to 300 fluid ounces of water. It was observed that some of the foliage was burned by the application. Subsequent spraying with the fish-oil soap alone caused the same injury, hence it is concluded that the tobacco extract did not cause the damage.

In view of the considerable damage done by insects and diseases of the apple in the State during the past season, an outline of the spraying treatment applied to the college farm orchard is here given, including the special treatment for the control of green aphids or plant lice upon apples.

[Report of botanical investigations], B. D. HALSTED ET AL. (*New Jersey Stas. Rpt. 1913, pp. 537-588, pls. 12*).—Inheritance studies of various crosses of sweet, pop, and flint varieties of corn and of peppers (E. S. R., 30, p. 342) were continued in 1913. Starchy and sweet grains from different corn crosses were grown and data are given with reference to the transmission of such characters as length of stalks, number and weight of ears, and color and texture of the grains. F₂ grains of Country Gentleman crossed with Squaw were selected from 10, 12, 14, and 16 rowed ears as well as from zigzag ears. There was some evidence of inheritance of row character to the extent that the greater the number of rows in the parent ear the greater the tendency to produce many-rowed and zigzag ears. The proportion of zigzag ears was greatest when taken from a zigzag parent ear. The 12-rowed ear was dominant in all of the plantings.

A test was also made of the viability and vigor of starchy and sweet grains selected from the same set of ears. The results show that when the starchy grains are heavier and larger but without any marked difference in specific

gravity, the viability of the starchy grains is very uniformly higher, as are also the weights of the seedlings. Plantings were made at depths of 1, 2, and 3 in. The mesocotyl for the starchy grains was shorter for the 1-in. plantings and nearly the same for the 2 and 3 in. depths. The range of variation in length of the mesocotyl was usually less with the starchy than with the sweet grains.

In the work with peppers some 14,000 plants were grown, a large proportion of which were of the second generation. Tabular data are given for the fruit of a large number of these crosses showing average weight, volume, length, and breadth, as well as the range in length and breadth, the average number of locules, and the range in number of locules. Data are also given showing the averages of weights, lengths, and breadths of F_1 and F_2 fruits and the relation of number of locules to size in F_2 fruits. Observations on pendency and uprightness in pepper fruits suggest that the position of the fruits follows the ordinary Mendelian segregation, with pendency dominant. With reference to the inheritance of deciduousness of pepper fruits it appears that deciduousness is dominant to persistency in F_1 , the latter appearing again as a recessive in F_2 . Observations on the inheritance of shape in the calyx for a number of crosses indicate that there is no well-defined segregation in the form of the calyx. Some general observations are given on pepper crosses with reference to spotted leaved, sterile, and dull fruited plants, plants with peculiar maturing colorations and with yellow foliage, and the best crosses commercially considered.

Report of progress, B. H. A. GROTH (*New Jersey Stas. Rpt. 1913, pp. 615-621, pls. 5*).—In continuation of previous work (E. S. R., 30, p. 343), about 4,500 plants of the third generation of tomato crosses were grown in 1913. All of the lots had been selected from F_2 generation plants in order to shed further light on the heredity of characters of size and shape. The results in detail are to appear in a subsequent bulletin.

The work has not demonstrated thus far a strict Mendelian inheritance of size or shape characters. It has been found that the size characters of the fruits behave differently in the first generation from those of the leaves and stems. In certain crosses the greater vigor of the F_1 plants is lacking in all of the F_2 plants, while in other crosses it is maintained even in the F_3 plants. The average fruit size of a F_2 generation agrees fairly well with the average of the parent F_1 generation, except in the crosses with long fruits. In one "Pear" cross the vegetative parts of F_2 plants averaged smaller than those of F_1 while the fruits averaged much larger.

A strong correlation has been found to exist between shape and the larger number of locules in the fruit. In crosses of flat fruits with long ones there was a correlation between absolute size and shape. Likewise the slaty foliage color of "Peach" tomatoes and the dull surface of their fruit skins were correlated with flabby interior of the fruit and invariably accompanied by a poor filling of the locules, although this latter condition may exist independently of the other characters.

In some crosses it was easy to reproduce the absolute size of the parent fruits in F_2 and F_3 ; in others the fruits of the larger parent were not even approximated. Some of the F_3 lots of "Ponderosa" crosses bred true to a very light-green foliage color. One F_3 block of "Peach-Pear" crosses bred true to a pear shape of greater relative and absolute length than was found in either parent. Other F_3 blocks bred true to a factor for simultaneous ripening and cessation of flowering after this ripening period. Among the F_3 lots of "Currant" crosses some seemed to be heterozygous and some homozygous for an exceedingly tough

skin. In the Ponderosa \times Dwarf Stone crosses of both F_2 and F_3 isolated plants were found that surpassed any tomato known to be on the market in solidity of the interior combined with absence of core and smooth round shape.

Further selections of many-celled and 2-celled fruits in the prairie berry failed to show any connection between cell number in the parent and in the progeny. The prairie berry has been crossed with another variety of the black nightshade with the view of determining whether fasciated fruit could be isolated by crossing in this manner: Several F_2 plants of this cross have appeared in which the fluctuation in cell number of the prairie berry reappears but not in which fasciated fruits are the rule. Certain dwarf plants were secured from this cross, whereas no dwarf plants have thus far appeared in the breeding work with prairie berries.

The sap circulation experiment outlined in the previous report (E. S. R., 30, p. 343) gave inconclusive results and is to be repeated under more favorable circumstances.

The study of the effect of various chemicals on plants was continued. The tests involved the effects of equal amounts of NO_3 , SO_3 , PO_4 , and Cl in the form of similar sodium, potassium, calcium, and ammonium salts. Buckwheat was used in one set of pots and buckwheat and sweet potato vine in another set. The results thus far here briefly studied show that the untreated pots and those containing chemicals soluble with difficulty matured first and kept ahead in growth. Those receiving the smaller excesses of nitrogen and phosphate salts developed much slower than the controls but began to branch out profusely later, and when the controls were already fully matured and dead the nitrogen plants especially became fully as large, more branched, and bloomed profusely. It is possible to distinguish between the symptoms of plants suffering from the lack of a salt and those suffering from an excess, and between plants suffering from equal doses of different salts, but thus far it has not been possible to tell whether a plant suffered from a small excess of one salt or from a large excess of another.

A study of inheritance in garden plants, E. J. OWEN (*New Jersey Stas. Rpt. 1913*, pp. 622-629, pl. 1).—In continuation of previous work (E. S. R., 30, p. 343) character transmission in a number of bean crosses is discussed and the average plant growth and yield of fruit in eggplant and okra crosses is given. Data are also given on limitation studies with beans and tomatoes, together with a brief note on tomato novelties. The limitation studies continue to show that the restriction of fruit bearing to one fruit in the parent plant leads to a greater development of blossoms in the progeny.

[Variety tests at the Edgeley substation], O. A. THOMPSON and J. H. SHEPPERD (*North Dakota Sta., Rpt. Edgeley Substa. 1912*, pp. 42-44).—For several years a number of varieties of apples, plums, cherries, gooseberries, currants, and strawberries have been tested with reference to their general adaptability to soil and climatic conditions at the substation. The varieties under observation are here classified with reference to their degree of hardiness. Trials made with different classes of vegetables show that it is possible to grow almost anything in the vegetable line at Edgeley.

Report of the horticulturist, C. C. NEWMAN (*South Carolina Sta. Rpt. 1914*, pp. 16-19).—A brief progress report on the work of the horticultural division.

As a result of the apple breeding work started by the station some ten years ago, more than 500 crosses have been made. Only a few of these trees have fruited thus far and only two crosses have shown any exceptionally desirable characteristics. One of these, Albemarle Pippin crossed on Golden Russet, fruited the past season and appears to be of promise for the Piedmont region of the South because it ripens very late in the season and is a splendid keeper.

A description is given of a seedling pear of the russet type which has fruited at the station for the past two seasons and promises to be one of the most valuable pears for the entire South.

The Chinese wood oil tree, which was received from the U. S. Department of Agriculture for testing purposes, fruited heavily during the past season and gives promise of being adapted for successful growth at the station.

Experiments have been conducted during the past three years to determine the best variety of Irish potato for a second crop. Of the varieties tested Lookout Mountain has given the best results. The tubers of this variety sprout very readily and an average stand of over 90 per cent can be secured, as compared with 40 to 60 per cent for other varieties. The tubers keep perfectly from November until planting time in July under ordinary storage.

A study of methods of propagating the scuppernong and other varieties of *Rotundifolia* grapes indicates that the best time for making cuttings of the *Rotundifolia* grapes is during the months of May, June, and July. Only about 15 per cent of dormant cuttings placed in the open ground during the fall will root. The green wood cuttings appeared to root much more readily than cuttings taken later on in the season.

Horticultural experiments at the San Antonio field station, southern Texas, S. H. HASTINGS and R. E. BLAIR (*U. S. Dept. Agr. Bul. 162 (1915), pp. 26, figs. 8*).—This bulletin gives the results of experiments conducted for a number of years (E. S. R., 32, p. 337) to determine the varieties of fruits best adapted to conditions in the San Antonio region, and also to find out what varieties or species may be used as stocks upon which desirable but less resistant varieties may be grafted. Suggestions are also given on cultural methods best adapted to the region.

The tests as a whole show that the climate is too severe for such fruits as oranges and olives and too mild for apples and cherries. Among the fruits which are considered more or less promising for the region are varieties of the South China race of peaches, a number of the American and Japanese plums, pears on the higher lands, figs, persimmons, pomegranates, jujubes, and dewberries. Cultivated varieties of grapes related to the native grapes may be grown but are not valuable as table grapes. The Rusk variety of citrange was hardy and made good growth.

Of the nuts tested, the native pecan does well as a lowland tree but has given poor results even under irrigation on the uplands. The Persian walnut makes good growth when worked on either *Juglans rupestris* or *J. nigra*. Almonds flowered so early as to be injured by frost. Pistache trees were found to be quite susceptible to root rot. Canada peas have proved to be the most satisfactory green manure crop.

Division of horticulture.—Summary of results, 1913, W. T. MACOUN ET AL. (*Canada Expt. Farms Bul. 77 (1914), pp. 68*).—This comprises a summary of results secured in 1913 in the breeding and cultural experiments with fruits, vegetables, forest and ornamental trees, and herbaceous plants conducted at the Central Farm, Ottawa, and at the various branch experimental farms and stations in Canada. The details of the work are to appear as usual in the annual report at a later date.

As result of long continued variety tests at Ottawa a list of the varieties of fruits is here given that are considered best for eastern and central Ontario and a considerable portion of the Province of Quebec, together with a list of the 25 best seedling apples originated at the farm. Since 1903 some 1,214 new varieties have been fruited.

Tent caterpillars were successfully controlled in the orchard by using arsenate of lead with lime-sulphur and with Bordeaux. In cases where masses of caterpillars were found on ornamentals and on individual trees a dust composed of pyrethrum and 4 parts of cheap flour as well as an emulsion made up of 8 oz. of flour and 1 qt. kerosene to 2 gal. of water were found to kill the caterpillars quickly by contact.

The work at the branch stations and farms consisted largely of variety tests. At the Kentville substation, Nova Scotia, W. S. Blair in charge, tests were made of Bordeaux *v.* lime-sulphur in controlling apple scab. Lime-sulphur was practically as effective as Bordeaux in controlling the scab and caused much less russetting of the fruit than Bordeaux. The 3:3:40 Bordeaux appeared to russet the fruit as much as the 4:4:40. Arsenate of lead used alone showed no fungicidal value.

Plant introduction and acclimatization, J. J. THORNER (*Arizona Sta. Rpt. 1913, pp. 255, 256*).—A brief statement of proposed work with native walnuts, elderberries, and currants, together with a list of native hardy ornamentals growing at the station grounds.

[Bean breeding investigations], G. F. FREEMAN and J. C. T. UPHOF (*Arizona Sta. Rpt. 1913, pp. 261-263*).—The work with beans has been confined to the selective breeding of the white tepary and to certain studies of inheritance among hybrids and pure races of both beans and teparies. Continued efforts to cross the bean upon the tepary and also the tepary and the Lima bean have resulted negatively. A few pods of the tepary-Lima cross were set but all failed to mature seed.

A small plat sown broadcast to tepary beans, at the rate of 60 lbs. per acre, gave an estimated yield of about $3\frac{1}{2}$ tons of air-dry hay per acre.

In the tepary breeding plat, 105 plant rows were grown, each row being from the seed of a single plant selection of the previous year. A marked contrast was observed between different rows as to the relative proportion of vine and seed, time of maturity, habit of growth, and productivity. The average for all races was 35 per cent of dry cleaned seed.

Phosphate for spinach, T. C. JOHNSON (*Virginia Truck Sta. Bul. 11 (1914), pp. 269-276*).—A previous bulletin gave in detail the plan of a combined fertilizer, soil management, and cropping system experiment with truck crops started by the station in 1908. The effect of various treatments, as measured by a crop of kale grown during the season of 1912-13, was also shown (E. S. R., 30, p. 532). In the present bulletin the author presents data for the 1913-14 kale crop and also shows the effect of various treatments as measured by crops of spinach during the season 1913-14. Although no conclusions are drawn from the work, thus far the results indicate that spinach requires a considerably larger quantity of phosphoric acid than is contained in the ordinary fertilizers used.

An apple orchard survey of Mills County, L. GREENE (*Iowa Sta. Bul. 153 (1914), pp. 252-316, figs. 35*).—This bulletin gives the results of a survey conducted in 1911-12 relative to the conditions and methods of management of the apple orchards in Mills County, Iowa. With results of this survey as a basis, suggestions are given relative to the renovation and care of apple orchards.

The orchard area in Mills County is about 3,000 acres, and the average age of the trees 19 years. The average planting distance was found to be 22 by 22 ft. Although no data were secured with reference to the effect of planting distance on yield, observations on the general conditions of the orchards indicate that the trees were planted too close for the best results. Eighty-two per

cent of the orchards were in sod, 8 per cent in sod mulch; 12.6 per cent was manured; and 11 per cent was partially tilled. The orchards return an average annual net profit per acre as follows: Sod, \$86.50; sod and manure, \$140.83; sod mulch and partial tillage, \$115. Orchards which were pruned annually yielded a much greater net profit than those pruned less frequently or not at all. The practice of spraying was not general in the county but the net returns from the orchards which were sprayed were greater than those from unsprayed orchards.

The most important diseases found were apple blight, blister canker, and apple blotch, and the more important insects were the codling moth and the apple and plum curculios.

Harvesting costs averaged for picking, 6 cts. per bushel; packing, 16 to 25 cts. per barrel; and hauling 2.2 cts. per barrel per mile. Of the orchards visited 76.5 per cent were operated by owners and 23.5 per cent by tenants. The average size of the farm was 102 acres and of the orchard 17 acres. Seventy per cent of the orchard men were of the opinion that the orchard was more profitable than other farm crops.

Experiments with fertilizers on cranberries, J. H. VOORHEES (*New Jersey Stas. Rpt. 1913, pp. 384-388*).—Outlines are given of some cooperative fertilizer experiments which have been started on a number of cranberry bogs in New Jersey. The work thus far outlined includes the application of single elements derived from different sources as well as a number of complete mixtures.

Strawberry growing, C. T. AMES (*Mississippi Sta. Bul. 165 (1914), pp. 21-23, fig. 1*).—Data are given on costs, yields, and returns from a five-acre strawberry field for the years 1908 to 1913, inclusive, together with brief notes on the culture of strawberries in the latitude of the Holly Springs substation.

During the first four years a net average of \$84.85 per acre was secured from the 5-acre field. The net returns for the last two seasons was \$30.63, or an average of \$66.80 per acre for the six years.

Citrus orchard heating, A. M. McOMIE (*Arizona Sta. Rpt. 1913, p. 250*).—A brief statement of results secured in protecting citrus groves from frost injury.

The data collected at the station farm, where one coal pot to every tree was used during the cold periods of December 22 and 23, 1912, and January 5, 6, and 7, 1913, indicate that when temperatures lower than 23° F. are reached little benefit results from their use. At the same time two vigorous yearling Mediterranean Sweet trees were only slightly injured when exposed to a temperature of 11° F. on January 7, 1913, while an adjacent weak tree of the same variety was killed to the ground. This test suggests that it may be possible to develop the citrus industry in Salt River Valley by a careful selection of hardy varieties and the maintenance of high individual tree vigor.

The planting and care of shade trees, F. E. BUOK (*Canada Expt. Farms Bul. 19, 2. ser. (1914), pp. 24, figs. 7*).—This bulletin contains practical directions and advice in the selection of shade trees, their planting, transplanting, and subsequent treatment and care, with notes on the principal injuries and unfavorable conditions to which shade trees are subjected, especially in towns and cities. Lists of varieties suitable for street and home planting in Canada are also given.

FORESTRY.

Forest planting in the eastern United States, C. R. TILLOTSON (*U. S. Dept. Agr. Bul. 153 (1915), pp. 38, pls. 7, fig. 1*).—A treatise on the establishment of forest plantations in the eastern United States, discussing the propagation of nursery stock, methods of planting, including costs and merits of the different

methods, time of planting, preparation of the soil, spacing, cultivation, thinning, pruning, choice of species for mixed plantations, protection, yields, and returns. Each species recommended for planting is considered with reference to its silvicultural requirements, soil adaptation, planting distances, planting method, products, and age of maturity, with reference to the prairie, central hardwood, and northeast regions. Introductory considerations deal with the opportunities for forest planting and the present status of forest planting in the eastern United States. Data on the prices of nursery stock, officers in charge of forestry in various States, together with literature dealing with planting are appended.

Forest, shade, and ornamental trees, O. A. THOMPSON and J. H. SHEPPERD (*North Dakota Sta., Rpt. Edgeley Substa. 1912, pp. 44-50*).—Notes are given on the behavior of a number of trees and shrubs which have been tested at the substation with reference to their value for shelter belts, windbreaks, hedges, and ornamentals.

The Araucaria woods of Chile, R. E. BAQUEDANO (*Bol. Bosques, Pesca i Caza, 2 (1914), No. 10, pp. 509-524, figs. 10*).—This embraces the results of a survey of the Araucaria forests of Chile with reference to their extent and distribution, habitat, amount of standing timber, natural products, possibilities of exploitation, etc.

The eastern hemlock, E. H. FROTHINGHAM (*U. S. Dept. Agr. Bul. 152 (1915), pp. 43, pls. 5, figs. 3*).—This bulletin discusses the eastern hemlock with reference to its geographical and commercial range; amount and value of standing timber; utilization; structure and development of the tree; associated species; effect of light, soil, and moisture on the composition of the stand; reproduction; rate of growth; susceptibility to injury; and the status of hemlock in forest management. A number of volume tables, applicable chiefly to average trees in the Lake States and Southern Appalachian region, are appended.

The author concludes, in brief, that hemlock grows too slowly and is of too little commercial value to be recommended for planting or for encouragement among natural second growth as a timber tree. The management of hemlock will ultimately be restricted to lands useless not only for agriculture but also for growing many kinds of commercial timber. It is desirable as a decorative tree for parks, and its heavy foliage and shade endurance give it exceptional value for the protection of stream sources. By virtue of its tolerance of shade hemlock adapts itself for growth as a subordinate stand among other kinds of timber. In such cases it materially increases the yield per acre and at the same time protects and enriches the forest soil, thereby tending to accelerate the growth of the other species.

The life history of lodgepole pine in the Rocky Mountains, D. T. MASON (*U. S. Dept. Agr. Bul. 154 (1915), pp. 35, pls. 5, fig. 1*).—In this bulletin the author discusses the lodgepole pine with reference to its geographical distribution and altitudinal range; size, age, and habit; climatic, soil, moisture, and light requirements; reproduction; growth; causes of injury; associated species; permanency of lodgepole type; ground cover; age classes; and yield.

[Relative success of timber-producing species at the Avondale Forestry Station] (*Gard. Chron., 3. ser., 57 (1915), No. 1468, p. 77*).—A summary of results secured during the first five years in growing various conifers and broad-leaved species at the station. The trees are arranged in order of their rate of growth and with reference to their hardiness.

Report on supplies of home-grown pit wood in England and Wales, T. H. MIDDLETON (*Bd. Agr. and Fisheries [London], Rpt. Supplies Home-Grown Pit Wood, England and Wales, 1914, pp. 13*).—This report embraces the results of

a survey which was made with a view to securing a home supply of mine props and other mining timber to take the place of that imported previous to the present war.

The hardness of woods, G. JANKA (*Mitt. Forstl. Versuchsw. Österr.*, No. 39 (1915), pp. VII+117, pls. 4).—In continuation of previous investigations (E. S. R., 20, p. 754) the author conducted hardness tests of some 286 kinds of coniferous and deciduous woods. Determinations were also made of the specific gravity, compressive strength, and shrinkage of the woods. The results are here presented in detail and discussed at length. The investigation was conducted primarily with a view to formulating a numerical classification of the hardness property of different kinds of native and foreign woods occurring in the Vienna trade.

Investigations on the accuracy of volume computations of stems by using the average diameter and length, M. KUNZE (*Mitt. K. Sächs. Forstl. Versuchsanst. Tharandt*, 1 (1912), No. 1, pp. 54).—The author here presents a study of volume and length measurements for various kinds and classes of trees in Germany.

The general conclusion is reached that the form factor of unbarked stems decreases regularly with an increasing average diameter and increases regularly with an increasing stem length. This relation was most marked with pine trees. The influence of diameter and length on the form factor is somewhat less when the bark is removed, but the variation of the form factor due to the absence of bark in the individual species is so small as to be negligible.

DISEASES OF PLANTS.

Report of the botanist and plant pathologist, H. W. BARRE (*South Carolina Sta. Rpt. 1914*, pp. 20–25).—The author reports additional investigations on the anthracnose of cotton, studies of which have been in progress for a number of years. In undertaking to control this disease the hot-water treatment has been investigated, and there was found to be a difference of about 20° C. between the thermal death point of the fungus in culture and the temperature at which the seed is killed. Following up this information it was found that cotton seed would stand a treatment of 75° C. in water for 10 minutes without injury. Plants that have been grown to maturity from treated seed have shown no presence of disease. In cooperation with the North Carolina and some other experiment stations variety tests of cotton for resistance to anthracnose are being carried on, but the author states that while there is considerable variation in the amount of disease on different varieties there has thus far been found no indication of very marked resistance.

Notes are given of studies that have been begun on bacterial diseases of cotton and on some physiological disturbances of the cotton plant.

Under the author's direction a plant disease survey of the State is being made, and one of the important discoveries of the past season was the occurrence of *Physoderma zea-maydis* on corn. Some cooperative work is briefly reported on the wilt of cotton and cowpeas, which is carried on with this Department and with planters throughout the State.

Notes of some plant diseases of 1913, W. P. FRASER (*Ann. Rpt. Quebec Soc. Protec. Plants [etc.]*, 6 (1913–14), pp. 45–50, figs. 3).—The following diseases were noted on the farm of Macdonald College in 1913:

Downy mildew of alfalfa (*Peronospora trifoliorum*) was held in check, probably by the very dry summer of 1913. No effective control measures have been found. Root and stem rot (*Sclerotinia trifoliorum*) was not as prevalent as in 1912 on field alfalfa, but clover grown on experimental plats suffered severely.

Rotation of crops for several years is recommended. This fungus, it is thought, may not be distinct from *S. libertiana*, which attacks vegetables, particularly in storage, and was common in 1912.

European apple tree canker (*Nectria galligena*) was found in an orchard of the college. This is supposedly the first report of this fungus on apples in Quebec, though it is thought to be common in the province.

Pea blight (*Ascochyta pisi*) was noted, but was not troublesome in 1913. *Septoria pisi* was common in some plats. These blights are kept under control by seed selection and rotation.

Millet smut (*Ustilago panici-miliacei*) was very serious on *Panicum miliaceum*. Formalin treatment of the seed controls the disease.

Stripe disease of barley (*Helminthosporium gramineum*), while severe on oats and on Mansury barley, did not attack other barleys. Formalin treatment gave good results.

Tip burn of potato was severe, being favored by the dry weather, decreasing the vitality of the plants. Conservation of moisture and control of insects and fungi by spraying held the disease in check. Tomato blossom end rot was prevalent, owing also to dry weather.

Raspberry cane blight (*Coniothyrium fuckelii*) was also prominent during the dry summer weather. No effective measures of control are known, but cutting out and burning diseased canes and cutting old canes as soon as the berries are picked helps to check the spread of the disease.

[Plant diseases in England], R. H. BIFFEN (*Jour. Roy. Agr. Soc. England*, 74 (1913), pp. 374-376).—This is a part of the report of the botanist for 1913 and deals very briefly with cases reported or sent in of diseases affecting cultivated plants.

Bacillus amylobacter seemed to attack potato tubers already infected by *Phytophthora infestans*. One case of black stalk rot, due to *B. melanogenes*, is noted. It is thought that the disease may be planted with the seed tubers. A case suspected to be *Spongospora scabies* was thought to be due to gritty soil constituents (as coal ashes), or to the excessive use of kainit. *Uromyces beta* and *Peronospora schachtii* are reported on mangolds, also mildew and club root of swedes. Clover sickness is reported as prevalent, and the use of clovers in rotation not oftener than once in six years is recommended. Bunt of wheat, though reported as being spread by traveling thrashing machines, is easily controlled by the copper sulphate or the hot water treatment.

The fruit diseases reported are peach curl, apple canker, leaf scorch, silver leaf, and strawberry spot. *Podosphaera leucotricha*, the cause of apple mildew, was found to be in itself parasitized by a species of *Cicinnobolus*.

Outbreaks of white rust (*Cystopus candidus*) on white mustard and of celery spot (*Septoria petroselinii apii*) were reported too late for effective control.

Other diseases, as larch canker, mildew on peas, asters, etc., and a spot disease on tobacco were dealt with.

The downy mildews, E. M. DU PORTE (*Ann. Rpt. Quebec Soc. Protec. Plants [etc.]*, 6 (1913-14), pp. 33-38, figs. 3).—This is a brief discussion of some *Peronosporaceæ* affecting economic plants, with a key to the genera.

The chemical composition of Bordeaux mixture and its soluble copper content, V. VERMOREL and E. DANTONY (*Compt. Rend. Acad. Sci. [Paris]*, 159 (1914), No. 3, pp. 266-268).—Reporting a study of the conditions leading to the formation of different compounds in Bordeaux mixture and of the question as to whether the alkaline mixture is free from soluble copper, the author states that when concentrated milk of lime is poured very rapidly into a dilute solution of copper sulphate the visible result is the blue color of stable copper

hydrates, but that when the lime water is poured very slowly the green color of basic copper sulphate is seen. The alkaline mixture in process of application is said to contain abundance of dissolved copper for fungicidal purposes.

Further observations on the fungicidal action of Bordeaux mixture, B. T. P. BARKER and C. T. GIMINGHAM (*Abs. in Rpt. Brit. Assoc. Adv. Sci.*, 1913, p. 767).—This gives briefly the substance of a contribution already noted from another source (*E. S. R.*, 32, p. 243).

The physiological effect of the absorbed copper on the treated plant is also under investigation.

Seed treatment to prevent diseases in field crops, O. A. THOMPSON and J. H. SHEPPERD (*North Dakota Sta., Rpt. Edgeley Substa.*, 1905, pp. 19, 20).—Directions are given for the treatment of cereals, flax, and potatoes with formaldehyde solution for the prevention of the various diseases.

Foot disease of cereals, SCHRIBAUX (*Bul. Soc. Nat. Agr. France*, 74 (1914), No. 4, pp. 413-423).—Tests were made in 1913 with a number of wheat varieties, also some hybrids thereof, both in test plats and in the open field, as regards susceptibility to foot or stalk disease. One of these varieties, Poulard d'Australie, seemed almost entirely resistant, this variety being later than native wheats and showing a less rank vegetative growth in early spring. In general, plats from seed of a given variety sown experimentally in both fall and spring showed fewer affected plants from the spring sowing. It is claimed that moderate vegetative growth and free access of sunlight are unfavorable to development of foot disease of cereals.

A cabbage disease, W. B. GROVE (*Jour. Roy. Hort. Soc.*, 40 (1914), No. 1, pp. 76, 77, fig. 1).—The author gives a brief description and the life history of a cabbage disease prevalent in the Isle of Wight, Cornwall, and elsewhere during the past winter.

The perfect stage, known as *Mycosphaerella brassicicola*, is said to be somewhat rarely found in that section, but the pycnidial stage occurs more commonly and abundantly and does considerable damage. This stage is said to have been described formerly as *Asteroma brassicæ*, but the author claims it should be classed as a *Phyllosticta* and he describes this form under the name *P. brassicicola* n. comb.

The only view given regarding remedial treatment is that such measures would probably prove to be of more expense than benefit in this case.

A note on celery leaf spot disease, F. J. CHITTENDEN (*Ann. Appl. Biol.*, 1 (1914), No. 2, pp. 204-206).—The author states that he has been able to demonstrate the infection of seedlings from seeds diseased by adhering spores of *Septoria petroselinii apii* which may be found, it is said, on about 90 per cent of the celery seed offered for sale. The fungus also attacks celeriac. The disease appears to spread more slowly during the seedling stage than later in the season.

Bordeaux mixture is said to afford satisfactory protection.

Diseases of peas (*Jour. Bd. Agr. [London]*, 21 (1914), No. 5, pp. 418-423, pl. 1).—Powdery mildew of peas (*Erysiphe polygoni*), said to attack also many weeds, is controlled by early spraying with liver of sulphur, 1 oz. to 4 gal. of water. Mildew (*Peronospora viciæ*), attacking many cultivated and wild legumes, requires employment of rotation, with Bordeaux mixture where outbreaks occur. Rust (*Uromyces fabæ*), which also attacks many members of this family, is most satisfactorily controlled by the destruction of the teleutospores, preferably by burning the vines. Black root rot (*Thielavia basicola*), said to be almost omnivorous and described as attacking young pea seedlings, lives saprophytically in humus soils. Formalin of about 1 per cent strength

applied at the rate of 1 gal. per square foot, is said to destroy the fungus if the soil is covered with coarse sacking for a few days, after which the fumes must be permitted to escape before planting the seeds. Pea spot (*Ascochyta pisi*) attacks also wild legumes. It is stated that this fungus may be controlled with Bordeaux mixture if applied on its first appearance.

Leaf spot and some fruit rots of peanut, F. A. WOLF (*Alabama Col. Sta. Bul.* 180 (1914), pp. 127-150, pls. 5).—The author describes three fungus diseases of peanuts occurring in Alabama. These are leaf spot, due to *Cercospora personata*, a red rot of the peanuts caused by *Neocosmospora vasinfecta*, and a sclerotial rot due to *Sclerotium rolfsii*.

The most prominent symptom of the leaf spot disease is said to be the presence of chestnut brown areas on the leaves, petioles, and stems, which may result in considerable defoliation, impairing the hay crop and indirectly reducing the yield of peanuts. Crop rotation and seed disinfection are recommended as preventive measures, spraying being considered impracticable. On account of the fact that the fungus has been found to hibernate on diseased leaves lying in the field, attention is called to the necessity of their destruction.

The fungus causing the red rot is not considered parasitic, and it occurs on peanuts only as a saprophyte. Digging the crop when mature without delay, it is thought, would reduce the amount of injury sometimes done.

The sclerotial rot is due to a parasite, both the shell and the kernel being destroyed. In addition to peanuts the fungus causing this disease is known to occur on a large number of host plants and as a consequence no remedial measures such as rotation can be recommended for its control.

A bibliography is appended.

Potato diseases, A. S. HORNE (*Ann. Appl. Biol.*, 1 (1914), No. 2, pp. 183-203, figs. 8).—This is a brief examination and discussion of several contributions from various authors regarding diseases of potato, including *Chrysophlyctis endobiotica*, *Phytophthora infestans*, sprain, *Fusarium solani*, curl, *Spongospora solani*, and other diseases.

Potato scab, B. F. LUTMAN and G. C. CUNNINGHAM (*Vermont Sta. Bul.* 184 (1914), pp. 64, pls. 12, figs. 7).—In a previous publication attention was called to the pathology of the potato scab (*E. S. R.*, 30, p. 539). In the present bulletin a detailed account is given of the investigations, from which it is concluded that the stimulation of cork products is due to the growth of an organism, resulting in the formation of chemical substances which are absorbed and which cause the cork cells to increase in size and number. According to the authors the organism which has hitherto been referred to as *Oospora scabies* should be designated as *Actinomyces chromogenus*.

This organism is widely spread, occurring in practically all soils, but is most numerous in those which are rich in humus. The parasitism of the organism is facultative and may be induced by an alkaline condition of the soil, the presence of moisture, and an abundance of organic matter of the soil. It is believed that some strains of the organism may have developed this character to a greater extent than others, but the authors were unable to recognize any morphological or cultural characters which would distinguish them. The organism is considered to be spread more probably through manure and humus than through scabby potatoes, though the latter should be avoided or thoroughly disinfected.

A weak acidity of the soil instead of a neutral or slightly alkaline condition is considered the most hopeful attack in combating this organism. The use of flowers of sulphur is said to be helpful in diminishing the amount of scab, but may prove harmful to other crops if applied in too large quantities. No

varieties of potatoes have been found that are wholly resistant to this disease, although some differences have been observed. The cause of variation is not known.

A bibliography is included.

Report of the plant pathologist, M. T. COOK (*New Jersey Stas. Rpt. 1913*, pp. 793-817, pls. 7).—The author reports the discovery of the silver scurf (*Spondylocladium atrovirens*) of potatoes in the State. Notes are also given of other investigations, and the most common diseases observed during the year are reported according to host plants.

The report concludes with an account of potato field tests carried on under the supervision of G. W. Martin to determine whether finely pulverized sulphur and powdered arsenate of lead can be depended upon to protect the potato foliage from insect injury and fungus disease. Four powdered preparations were used and comparisons made with Bordeaux mixture, Paris green, Pyrox, and two other commercial preparations. It is concluded from the tests made that a mixture of pulverized sulphur and arsenate of lead is practicable and efficient in controlling the Colorado beetle. The most striking results obtained showed the economy of Bordeaux mixture and also the short time required to apply powders. Under the conditions of the experiment the cheapest and most efficient preparation used was a dust mixture composed of three parts of sulphur and one part of arsenate of lead.

Storage rots of potatoes and other vegetables, W. P. FRASER (*Ann. Rpt. Quebec Soc. Protec. Plants [etc.], 6 (1913-14), pp. 50, 51*).—Brief descriptions are given of black and blue mold rots, late blight rot, dry rot, and soft rot of potatoes. Control measures include crop rotation, careful harvesting in dry weather, and storage in clean, moderately dry cellars at not above 40° F.

The biology of the apple canker fungus, S. P. WILTSHIRE (*Abs. in Rpt. Brit. Assoc. Adv. Sci., 1913, p. 714*).—*Nectria ditissima* is said to be a genuine wound parasite, succeeding only in case of injury deep enough for the fungus to reach the wood before it is shut off by the formation of a layer of phellogen. The fungus traverses the intercellular spaces of the cortex, breaks through the cell walls of phloem and cambium, and traverses the woody elements via the pits in the walls, the medullary rays offering no special means of access to the interior.

The host reacts by the formation of phellogen, of abnormal wood cells resembling those of the medullary rays, and of wound gum in the wood vessels. The mycelium normally does not spread greatly. Inoculation usually occurs by means of injuries due to frost or aphids. Relatively immune varieties of apple may be infected through injuries under suitable conditions, the determining factors being mostly physiological.

Observations on the life history of the American gooseberry mildew, E. S. SALMON (*Ann. Appl. Biol., 1 (1914), No. 2, pp. 177-182*).—The author, referring to his previous article (*E. S. R., 31, p. 545*), gives results of a further examination of material, concluding that some of the perithecia of the American gooseberry mildew (*Sphaerotheca mors-uvæ*) which are produced in England either do not reach maturity or do not survive the winter. It is claimed that no case of primary infection by ascospores from overwintered material still present on the shoot has been established. It is thought that ascospores from mature perithecia lodged in bark crevices, bud scales, etc., may possibly be the ones which become the source of the early infection noted.

The control of American gooseberry mildew, G. C. GOUGH (*Gard. Chron., 3. ser., 56 (1914), Nos. 1454, pp. 303, 304; 1455, p. 319*).—Giving the advantages and disadvantages of various methods of dealing with American gooseberry mil-

dew as shown by experience in many typical cases and in representative parts of England for some years past, the author states that the order of the Board of Agriculture and Fisheries requiring the destruction of all diseased bushes has been withdrawn, although destruction is still recommended where bushes are old and badly diseased. Owing to the habits of the fungus as described, spraying has proved impracticable in a large number of cases, and it is thought to be of value only in cases where the disease has appeared recently and is noted in time (soil infection being slight or absent), or where the object is to keep the fruit free from disease for marketing. No definite or uniform success has attended soil treatment. The value of pruning if done early and properly is said to be decided, but to have its own disadvantages, which are outlined, chief among these being its usually late or imperfect accomplishment.

Banana disease on the Clarence River (*Agr. Gaz. N. S. Wales, 25 (1914), No. 9, pp. 809, 810*).—For the past two or three years a new disease has been noted among bananas on the Clarence River. It is known locally as pear top, bunch top, blight, or rust. Investigation has not shown it to be caused by bacteria or fungi and it is thought to be of physiological origin. Soil exhaustion is suggested by the facts that it appears only on old plantations and that sugar cane on such soils shows a similar habit.

Remedies suggested are thinning, rotation, and fertilizing according to formulas given.

Cacao canker and its control in Java, C. J. J. VAN HALL (*Meded. Proefstat. Midden-Java, No. 6 (1912), pp. 17*).—The author, referring to the claim of Rorer (*E. S. R., 27, p. 750*), confirmed by Rutgers (*E. S. R., 29, p. 248*), that *Phytophthora faberi* is the cause of both cacao canker and black or brown pod rot of cacao, notes the facts that in artificial cultures *P. faberi* is quickly overgrown by *Fusarium colorans* associated therewith, and may disappear from the margins, easily giving the impression that *F. colorans* is the primary cause of the trouble, which is really due to *P. faberi*.

Control measures recommended include the removal of all cankered fruits or of spots on the tree, the production of unfavorable life conditions for the parasite (as by better control of shading, involving attention to both the cacao trees and others growing therewith), and the prevention of infection or or spread in case of incipient attack, as by the use of such fungicides as Bordeaux mixture.

Notice relating to citrus canker, E. S. TUCKER (*Louisiana Stas. Crop Pest Notice 1 (1914), pp. 2*).—Attention is called to the occurrence of the citrus canker in Louisiana and a plea is made for the prompt cooperation of citrus growers to secure its eradication.

Coffee leaf disease, W. SMALL (*Uganda Dept. Agr. Circ. 1 (1914), pp. 8*).—This disease (due to *Hemileia vastatrix*) is said to be endemic in Uganda, having been present on practically every tree of native coffee for many years, but to have been only recently recognized definitely as to species and importance. It is said to be known now in all coffee-growing countries of the Old World. In 1913 losses on areas of recent planting amounted to 30 per cent in many instances, but on some of these areas the trees afterwards showed new shoots and foliage and some promise of good crops.

Such preventive measures are recommended as give access of sunlight and wind. These include planting in dry localities with wide spacing, the plats so arranged that the prevailing winds may sweep them crosswise rather than lengthwise. Destruction of all fallen and visibly diseased leaves is considered important. Careful selection of material for planting, appropriate manuring, supervision of native trees, etc., are measures relied upon to reduce the amount

of the disease, which is expected to appear sooner or later on every estate of cultivated coffee in Uganda.

Diseases and pests of Hevea in the Federated Malay States, A. A. L. RUTGERS (*Dept. Landb., Nijv. en Handel [Dutch East Indies], Meded. Afdeel. Plantenziekten, No. 4 (1913), pp. 8-16*).—This is mainly a discussion of Hevea as affected by canker in relation to weather, particularly rainfall; spacing in planting, also interplanting with other growths; pruning; and employment of water in connection with tapping operations.

Fomes semitostus, the cause of a root mold, is also briefly discussed.

Observations upon a disease of carnations, M. A. BLAKE (*New Jersey Stat. Rpt. 1913, pp. 168-170, fig. 1*).—The author reports having noted at different times a disease of carnations in which there was a red spotting of the leaves of red varieties and of some dark pink varieties. The light pink, white, or yellow varieties may be affected by the spots, but less commonly and the spots are more translucent. The injured leaves on all varieties gradually turn brown, giving the plants a sickly and dying appearance.

Various theories have been advanced as to the cause of this trouble. The author states that experiments have shown that considerable injury often follows the setting of carnation plants in soil that does not dry freely. Excess of moisture does not appear to be one of the important factors in the matter, but it seems to be a soil condition. It is thought that if proper cultural conditions are maintained the amount of injury may be reduced. Cuttings from diseased plants have been propagated without showing any sign of the disease.

ECONOMIC ZOOLOGY—ENTOMOLOGY.

Animal communities in temperate America as illustrated in the Chicago region.—A study in animal ecology, V. E. SHELFORD (*Geogr. Soc. Chicago Bul. 5 (1913), pp. XIII+362, pl. 1, figs. 315*).—The author defines ecology at present as "that branch of general physiology which deals with the organism as a whole, with its general life processes, as distinguished from the more special physiology of organs, and which also considers the organism with particular reference to its usual environment."

The several chapters of this work deal with the subject under the headings of man and animals; the animal organism and its environmental relations; the animal environment, its general nature and its character in the area of study; conditions of existence of aquatic animals; animal communities of large lakes (Lake Michigan), streams, small lakes, and ponds; conditions of existence of land animals; animal communities of the tension lines between land and water, of swamp and flood plain forests, of dry and mesophytic forests, and of thickets and forest margins; and prairie animal communities.

A bibliography of 214 titles and author and subject indexes are included.

Preliminary report on the mammals of North Dakota, V. BAILEY, W. B. BELL, and M. A. BRANNON (*North Dakota Sta. Circ. 3 (1914), pp. 20*).—Following a brief discussion of life and crop zones, habits of animals, and preparation and care of specimens, the authors present brief accounts of some 80 species of mammals known to occur in North Dakota.

Studies in the comparative size of the red blood corpuscles of birds, CHI TSAU WANG (*Jour. Ent. and Zool., 6 (1914), No. 4, p. 221*).—Studies of the erythrocytes of 17 species are reported upon.

Entomology, A. W. MORRILL (*Arizona Sta. Rpt. 1913, pp. 270, 271*).—Particular attention is said to have been given the harvester ant (*Pogonomyrmex barbata*) and the alfalfa seed chalcis fly (*Bruchophagus funebris*). Through

the use of sheet-iron covers inclosing circular areas 4 and 10 ft. in diameter, respectively, it was found that a maximum dose of 2 oz. of carbon bisulphid, costing approximately 1 ct., completely eradicated the ant colony when the ground was still quite wet following irrigation. With soil insufficiently moist the results were not dependable even with much larger doses. The author considers it practicable for an individual possessing an outfit of ten or more such covers to take contract work on a large scale.

In Arizona, the alfalfa seed chalcis fly, also known as the clover seed chalcis fly, is one of the most destructive pests, not only on account of direct injury, but through its keeping many alfalfa growers, who would otherwise be interested, from attempting to make a seed crop. A trap crop experiment was carried on during the year, in which a border of some 40 ft. all around a 10-acre field was left uncut at the time of the second regular hay cutting on May 5, when the remainder of the field was cut and the hay stacked. This border was allowed to bloom and set seed which attracted the seed flies in the vicinity, it being the only alfalfa having seed available for the oviposition of the eggs. This border crop was cut and the hay removed from the field before the insects had sufficient time to reach maturity. While it is believed that the bordering trap crop actually afforded considerable protection, the practical results appeared to be mostly negative since the crop from the field averaged 210 lbs. per acre, which was not more than would be expected under ordinary conditions. It is pointed out, however, that the experiment was conducted under unfavorable conditions since a nearby grain field infested with bur clover produced myriads of the seed flies of the first brood which spread over the surrounding fields.

Report of the entomologist, T. J. HEADLEE (*New Jersey Stas. Rpt. 1913, pp. 633-789, pls. 4, figs. 3*).—The insects of the year briefly noted, information relating to which is largely based on correspondence, include various species of plant lice, scale insects, the false apple red bug (*Lygidea mendax*), rhododendron lace bug (*Leptobyrza explanata*), flea-beetle (*Epitrix cucumeris*), which proved to be the worst insect enemy of the potato during the year, fruit bark beetle (*Scolytus rugulosus*), which attracted attention by its work on peach, hickory bark beetle (*S. quadrispinosus*), etc. Insects mentioned as of special interest, either because new to New Jersey records or because of the danger of their introduction, include an undetermined buprestid borer on *Rosa rugosa* nursery stock, a pine scolytid (*Myelophilus piniperda*), which bores out the tips of the central shoots of Scotch firs, a sawfly (*Kaliosysphinga dohrnii*) new to New Jersey found doing considerable damage to alders in the nursery, etc.

In order to determine the relative value of a dusting mixture as compared with the normal liquid treatment, a series of orchard and potato tests were made. The dust was composed of 20 per cent powdered "Electro" arsenate of lead and 80 per cent very finely divided sulphur. Eleven and one-fourth lbs. of paste, consisting of the same finely divided sulphur with about 50 per cent water, and 1½ lbs. of the powdered lead arsenate were used to each 50 gal. of water. Application of the dust treatment to peaches at Glassboro is given credit for exerting a better control of the plum curculio than the paste or self-boiled lime-sulphur, and consequently for holding a much larger percentage of the total set on the entire tree. The results of similar peach tests at Vineland indicated "(1) that either dust or paste applied with sufficient frequency will give reasonable control of plum curculio and scab fungus, (2) that when dust or paste are applied no more frequently than self-boiled lime-sulphur arsenate of lead they are not so effective as the standard wash (3) that the paste sulphur and lead, which are much easier to make up and apply, are almost as efficient in insect and scab fungus control as the self-boiled mixture, (4) that

the dust must have more frequent applications than either the self-boiled or paste to produce anything like equal results."

No definite results were obtained from the tests with apples and potatoes. The experiments with corn show: "(1) That when the poisonous dust is properly placed on the corn silks and maintained throughout the period the silks are green and succulent, more than 75 per cent of the normal damage is prevented, (2) that any machine which distributes the dust in such a fashion as to produce only a light coating on exposed parts is of little or no value in corn earworm control, (3) that the dust must be maintained throughout the period during which the silks are green and succulent, (4) that the 50 per cent mixture is the most efficient, because its physical condition is better (drier) than the 75 per cent, and has more strength than the weaker mixture."

Work with the peach borer carried on in continuation of that of the previous year (E. S. R., 30, p. 355), in which each of 28 5-year-old peach trees was coated with tree tanglefoot from the point where the large roots came off to a point 6 in. above the surface of the soil, showed that although in common with other substances the tanglefoot reduces the infestation, it not only fails to prevent it completely, and if used regularly is likely to destroy the trees.

In summing up the results of fly work the author states that "the fly control campaigns in the city of New Brunswick, on the college general farm, and on the college dairy farm, have shown: (1) The need of cooperation between the fly-suppressing agency and the persons running the premises on which a fly campaign is in progress; (2) the utter insufficiency of the Hodge and other fly traps as a complete control—demonstration of the fact that they are at best but an adjunct; (3) the impracticability of obtaining anything like a general adoption of the Hodge garbage can trap and its ineffectiveness as a destroyer of the house fly, the really serious carrier of infection; (4) the surpassing importance of eliminating the fly-breeding places; (5) the usefulness of iron sulphate and carbon bisulphid as larvicides; (6) the effectiveness of sulphur as a destroyer of adult flies; (7) the effectiveness of even incomplete work on fly control."

A report upon the mosquito work for 1913 follows (pp. 719-789). The author states in general that the work has proved as successful as the seasonal conditions would permit. A brief account of the occurrence of the mosquitoes of the year is included.

Summary of entomological information during 1914 (*Agr. News* [Barbados], 13 (1914), No. 330, pp. 408, 409).—A brief review.

Proceedings of the Entomological Society of British Columbia (*Proc. Ent. Soc. Brit. Columbia, n. ser., No. 4* (1914), pp. 83).—Among the more important papers here presented are the following: Insect pests of the year in the Victoria District, by E. H. Blackmore (pp. 11-14) and in the Okanagan District, by W. H. Brittain (pp. 14-19); those economically important in the lower Fraser Valley, Vancouver District, by R. C. Treherne (pp. 19-33); Bee Diseases in British Columbia, by F. D. Todd (pp. 33-36); The Tent Caterpillar (*Malacosoma erosa*), by T. Wilson (pp. 36-38); Preliminary Note on the Work of *Eriophyes* sp. upon Apples, Apricots, and Plums (pp. 38, 39), and Ants as Fruit Tree Pests (p. 39), by W. H. Brittain; Notes on the Life Histories of Bloodsucking Diptera of British Columbia, with Special Reference to the Tabanidae, by S. Hadwen (pp. 46-49); A Review of Applied Entomology in British Columbia, by R. C. Treherne (pp. 67-71); and Mites, Their Classification and Habits, with Some Observations on Their Occurrence in the Okanagan, by J. S. Dash (pp. 71-78).

A preliminary survey of forest insect conditions in British Columbia, J. M. SWAINE (*Canada Expt. Farms Bul.* 17 (1914), 2. ser., pp. 41, pls. 2, figs. 22).—

This is a report of a survey made during the summer of 1913 with the view of determining the location and extent of the chief forest insect injuries, and to decide upon proper control measures for the more serious outbreaks. But a small portion of the southern part of the forest area of British Columbia could be covered.

The bull pine, or western yellow pine (*Pinus ponderosa*), occurs in British Columbia only in the southern part of the interior. It is subject to attack throughout its range in British Columbia by three destructive species of bark beetles, viz, the western pine bark beetle (*Dendroctonus brevicomis*), the western white pine, or mountain pine bark beetle (*D. monticolæ*), and the red turpentine bark beetle (*D. valens*), and by a number of pests of lesser importance. The most important and extensive injury was found to occur about Princeton, in the southwest portion of the bull-pine area.

The mountain pine, or western white pine (*P. monticola*), occurs in British Columbia from the valley of the Columbia River to Vancouver Island. It is subject to attack from several species of bark beetles, *D. monticolæ* being particularly destructive in the interior and on Vancouver Island.

The lodgepole or black pine (*P. murrayana*) occurs throughout the interior of British Columbia and is subject to attack by *D. monticolæ* and *D. murrayanae*, and by a number of species of secondary importance.

The Douglas fir (*Pseudotsuga mucronata*) extends over a very wide area in the southern half of British Columbia, from the eastern foot-hills of the Rockies to the coast and Vancouver Islands, with a very irregular northern and northwestern limit; in the area covered by the survey there was no very extensive insect injuries found. The Douglas fir bark beetle (*D. pseudotsugæ*) is thought to be the most serious enemy and a number of other species are important secondary enemies.

The Sitka spruce occurs in British Columbia throughout the coast region and on Vancouver Island. Its most injurious insect enemies are the Sitka spruce bark beetle (*D. obesus*) and the western spruce gall louse.

Brief accounts are given of the ambrosia beetles, also known as timber beetles or pin-hole borers, of which the two most important on conifers are *Gnathotrichus retusus* and *G. sulcatus*, and of the Pacific Coast timber beetle, *Platypus* sp., which is abundant on the coast and island. Brief mention is made of the larger wood borers of the families Cerambycidae and Buprestidae.

Accounts of the life history, habits, and injury of, and control measures for the most important species discussed in the bulletin are included. A map, showing the limits of forest trees in southern British Columbia, is added.

Concerning infection through insects, T. A. VENEMA (*Hyg. Rundschau*, 24 (1914), No. 20, pp. 1073-1083).—A summarized account of the transmission of disease organisms by insects.

Transmission of disease by native bloodsucking insects, A. SCHUBERG and W. BÖING (*Arb. K. Gsndhtsam.*, 47 (1914), No. 3, pp. 491-512, fig. 1; *abs. in Rev. Appl. Ent.*, 2 (1914), Ser. B, No. 11, p. 169).—This third paper (E. S. R., 28, p. 756) deals with the experimental transmission of anthrax and of streptococci to the sheep and goat by the stable fly (*Stomoxys calcitrans*), a brief account of which has been previously noted from another source (E. S. R., 29, p. 760).

A contribution to the biology of sewage disposal, J. W. H. JOHNSON (*Jour. Econ. Biol.*, 9 (1914), Nos. 3, pp. 105-124; 4, pp. 127-164, figs. 33).—In the course of this discourse the author deals at some length with the sewage fly or moth fly (pp. 136-143), particularly *Psychoda phalaenoides* and *P. scapunctata*; and the water spring tail (*Achorutes viaticus*) (pp. 143-149). Where circumstances

favor their development the psychodids may appear in myriads at certain times of the year and be carried by the wind into inhabited neighborhoods so as to give rise to an intolerable nuisance.

The biology of the three pests named is dealt with.

The grasshopper problem and alfalfa culture, F. M. WEBSTER (*U. S. Dept. Agr., Farmers' Bul.* 637 (1915), pp. 10, figs. 8).—Three species of grasshoppers are said to be largely responsible for the injury to alfalfa in the United States, namely, the differential grasshopper (*Melanoplus differentialis*), the two-striped grasshopper (*M. bivittatus*), and *M. atlantis*, a more or less migratory species. Hardly a season passes without more or less serious outbreaks of these pests. The publication consists largely of a popular account of them, their natural enemies, and preventive and remedial measures.

Thrips attacking the leek (*Thrips tabaci*), A. VUILLET (*Rev. Phytopath. Appl.*, 1 (1913), No. 10, pp. 136, 137; *abs. in Rev. Appl. Ent.*, 2 (1914), Ser. A, No. 5, pp. 278, 279).—In 1913 an attack by *T. tabaci* in the Department of Sarthe resulted in a reduction of the leek crop by 50 per cent.

Contribution to the knowledge of the sucking phenomena of plant lice and the reaction of plant cells, F. ZWEIGELT (*Centbl. Bakt. [etc.]*, 2. Abt., 42 (1914), No. 10-14, pp. 265-335, pls. 2, figs. 7).—An anatomo-cytological study of plants and coccids and aphidids. A bibliography of 65 titles is appended.

Phylloxera galls affecting pecan trees, E. S. TUCKER (*Louisiana Stas. Crop Pest Notice* 2 (1914), pp. 8, fig. 1).—This is a brief account of the occurrence and nature of galls on pecan trees in Louisiana caused by *Phylloxera caryæ-caulis*, *P. devastatrix*, and *P. perniciosa*.

The oak scale and its control (*Lecanium quercifex*), W. F. TURNER (*Alabama Col. Sta. Circ.* 28 (1914), pp. 105-110, fig. 1).—The oak scale is the source of considerable injury in Alabama and the other Gulf States to oaks, several species of which, particularly the water oak (*Quercus nigra*), are the principal street and shade trees. The injury, while not confined to the young trees, is much less apparent on the older ones. The pest is becoming more and more abundant every year and constitutes a very serious problem in the care and maintenance of shade trees.

At Auburn, Ala., egg deposition commences early in April and continues for about three weeks. Counts made of the eggs deposited by three females gave 2,245, 5,000, and 5,262, respectively. The incubation period was found to be about 26 days. The young are very active and may travel considerable distances before settling, which occurs principally along the main or larger lateral veins of the leaf. They may remain active for a considerable length of time even after they reach the leaves. After settling they remain on the leaves until fall, apparently remaining in the first stage throughout the summer. Migration to the small twigs, where they remain dormant throughout the winter, takes place the last of September. In February when the sap begins to flow growth commences which continues until the last of March when it becomes very rapid and they soon attain their full adult size.

The natural enemies of this species include two undetermined hymenopterous parasites and several lady beetles of which *Chilocorus vivulnerus* is the most important. Spraying experiments have shown Schnarr's insecticide 1:20 and emulsions of Junior Red Engine and Diamond paraffin oils when applied in March to kill about all of the scales with which they come in contact. The emulsions are made by using 2 gal. of either oil to 1 gal. of whale oil soap and 50 gal. of water.

The control of the moth borer, J. J. QUELCH (*Abs. in West India Com. Circ.*, 29 (1914), No. 421, pp. 536, 537).—In this paper the author reports studies on the control of the small moth borers (*Diatræa saccharalis* and *D. canella*),

which cause much damage to sugar cane in British Guiana. Egg parasites of these pests are said to be particularly effective, at times as high as 95 per cent of the eggs in the field being parasitized.

A wood-boring moth (*Agr. News [Barbados]*, 13 (1914), No. 325, p. 328).—This is a discussion of *Duomitus punctifer*, an account of which is included in the paper by Bovell and Nowell previously noted (*E. S. R.*, 31, p. 547). The larva of this moth is injurious to a wide range of trees and shrubs and is generally distributed in the Lesser Antilles. It tunnels in the whitewood tree (*Tecoma leucoxydon*) in all directions in the larger branches and through the middle of the smaller ones even to fine twigs. Its life history is said to resemble closely that of the leopard moth (*Zeuzera pyrina*).

Relation between the larvæ of vine moths (*Cochylis ambiguella* and *Polychrosis botrana*) and the weeds of vineyards and other plants, G. LÜSTNER (*Ztschr. Weinbau u. Weinbehandl.*, 1 (1914), No. 1, pp. 3-35; *abs. in Internat. Inst. Agr. [Rome]*, *Mo. Bul. Agr. Intel. and Plant Diseases*, 5 (1914), No. 6, p. 826).—In experiments carried out in the fall *Cochylis* larvæ were observed to be distinctly polyphagous, even devouring euphorbiaceous plants. Experiments with *Polychrosis* larvæ conducted in the spring showed them to be equally polyphagous.

Contribution to the study of the biology of *Hyponomeuta malinella* in Roumania, G. FINTZESCU (*Rev. Sci. Bourbon.*, 27 (1914), No. 3, pp. 78-80; *abs. in Rev. Appl. Ent.*, 2 (1914), Ser. A, No. 9, p. 564).—The author, who has studied this lepidopteran for many years, reports that there are three generations each year in Roumania.

The bacterial diseases of caterpillars, R. W. GLASER (*Psyche*, 21 (1914), No. 6, pp. 184-190).—This is a brief review of the literature relating to the subject.

The author states that while there seems to be a considerable amount of collateral evidence that caterpillars are subject to bacterial diseases, he is not familiar with a single case where this has been conclusively proved. It is pointed out that many of the authors reviewed agree that the flacherie-like diseases are primarily intestinal affections and that the bacteria concerned are found outside of the intestine, in the body cavity, only during the later stages when the alimentary canal ruptures.

"While it therefore seems possible that some of the caterpillar diseases now grouped under the name of flacherie are intestinal disturbances caused by toxic products liberated within the alimentary tract by specific bacteria, it is not at all unlikely that other diseases affect other parts of the body, such as the disease described by Picard and Blanc [*E. S. R.*, 29, p. 855]. The entire subject, however, is still one for controversy."

A bibliography of 14 titles is appended.

[Cecidomyiid flies attacking willows] (*Bul. Soc. Nat. Acclim. France*, 61 (1914), No. 1, pp. 24, 25).—The habits of two cecidomyiids, *Rhabdophaga rosaria* and *R. pulvini*, which are at times a source of serious injury in oseries are briefly considered. *Salix purpurea*, *S. depressa*, *S. aurita*, and *S. cinerea* are the species that suffer most from their attack.

Economic and biologic notes on the giant midge (*Chironomus (Tendipes) plumosus*), A. C. BURRILL (*Bul. Wis. Nat. Hist. Soc., n. ser.*, 10 (1913), No. 3-4, pp. 124-163).—This paper deals at some length with the life history and habits of this midge, its natural enemies, economic importance, and remedial measures. An annotated bibliography of 14 pages is appended.

Mosquitoes and sewage disposal, F. KNAB and A. BUSCK (*Amer. Jour. Trop. Diseases and Prev. Med.*, 2 (1914), No. 5, pp. 333-338).—The authors point out that certain species of mosquitoes, particularly *Culex pipiens* and

C. quinquefasciatus, multiply most rapidly in the presence of highly polluted water, and discuss an outbreak investigated that had its origin at sewage-disposal plants.

Stomoxys calcitrans, A. RUTHERFORD (*Trop. Agr. [Ceylon]*, 42 (1914), No. 3, pp. 222-225).—This comprises notes on the stable fly (*S. calcitrans*) with quotations from the literature. The horn fly (*Hæmatobia serrata*) also occurs in Ceylon.

On a larva of a species of *Muscinae*, living in the nest of *Passer griseus* in the Kongo, J. RODHAIN (*Rev. Zool. Afric. [Brussels]*, 3 (1914), pp. 213-217, fig. 1; *abs. in Rev. Appl. Ent.*, 2 (1914), Ser. B, No. 4, p. 69).—Larvæ and pupæ of a fly belonging to the subfamily *Muscinae* were taken from the nests of the gray-headed sparrow (*P. griseus*) and upon examination the larvæ were found to contain avian blood.

Inheritance of the length of life in *Drosophila ampelophila*, R. R. HYDE (*Proc. Ind. Acad. Sci.*, 1913, pp. 113-124, figs. 5).—The conclusions drawn from the author's investigations with the pomace fly are in part as follows:

"Hybrids between the truncate stock and the inbred stock are more vigorous than either parent, as shown by the fact that the hybrid lives 47 days while . . . the flies from the truncate stock . . . live 21.4 days, the females live 18.4 while the males live 26.4 days. The flies from the inbred stock live 37.4 days. The females live 34.5 days while the males live 40.5 days. The shortened length of life of the truncate stock reappears among the grandchildren after skipping a generation when crossed to the inbred stock. . . . Those descended from the truncate grandmother lived 29.5 days. The males lived 32.8 days and the females lived 25.9 days. The flies descended from the truncate grandfather lived 29.3 days. The males lived 31.1 days, while the females lived 27.3 days. It seems not improbable that the length of life and the coming to maturity of the germ cells may be in some way physiologically connected."

Cane grub and muscardine fungus at Cairns, H. TRYON (*Queensland Agr. Jour.*, n. ser., 2 (1914), No. 6, pp. 402-405).—The author states that *Metarhizium anisopliæ* is indigenous to Queensland.

[Report of] division of entomology, H. T. EASTERBY (*Ann. Rpt. Bur. Sugar Expt. Stas. [Queensland]*, 1914, pp. 55-57).—A brief statement is presented by A. A. Girault of the results of work with the so-called grub pest or cane beetle (*Lepidiota albobirtum*), details relating to which will be published later as a bulletin.

Wireworms attacking cereal and forage crops, J. A. HYSLOP (*U. S. Dept. Agr. Bul.* 156 (1915), pp. 34, figs. 8).—In an introduction the author gives a brief account of the feeding habits of the true wireworms (*Elateridæ*), and also of the false wireworms (*Tenebrionidæ*). Several hundred species of *Elateridæ*, which vary enormously in their habits, occur in North America; the majority attack the roots of plants but some live in dead and rotten wood (*Alaus*, *Elater*, *Adelocera*, etc.) and still others (*Alaus*, *Hemirhipus*, *Adelocera*, etc.) are predaceous. Some species abound in heavy moist soil filled with humus (*Melanotus*, *Agriotes*, etc.), some prefer well-drained soils (*Corymbites*), and still others (*Horistonotus*) are most destructive on high sandy land which is very poor in humus. It is stated that the large luminous elaterid of the West Indies (*Pyrophorus luminosus*) is a decidedly beneficial insect, since it feeds on the *Lachnosterna* larvæ in the sugar cane fields.

Brief accounts are given of the life history, habits, injury, occurrence, and remedial measures for some of the more important species, including the wheat wireworm (*Agriotes mancus*), the corn and cotton wireworm (*Horistonotus uhlerii*), the inflated wireworm (*Corymbites inflatus*), the dry-land wireworm

(*C. noxius*), corn wireworms (*Melanotus communis*, *M. fissilis*, and *M. cribulosus*), and a large number of species of minor importance. In an account of natural enemies, which follows, it is stated that birds are probably the most important factor in keeping wireworms in check. A list of the birds known by examination of the crops and stomachs to feed on Elateridæ, as compiled by the Biological Survey of this Department, is given. Other enemies mentioned are a small lizard (*Phrynosoma douglasii douglasii*) found in the desert regions of the Northwest, and locally known as the sand toad; several species of mites; a dipteran (*Thereva egressa*), the larva of which attacks and feeds upon wireworms; and the fungi *Penicillium anisopliæ* and *Metarrhizium anisopliæ*.

Remedial measures are discussed under the headings of treatment of seed, soil treatment, and cultural methods. It is stated that thus far cultural methods alone have proved to be of much practical value.

The wavy striped flea-beetle (*Phyllotreta sinuata*), E. M. DUPORE (*Canad. Ent.*, 46 (1914), No. 12, pp. 433-435, figs. 3).—The author records observations of this pest in Quebec in 1914, where it was found feeding on radish, turnips, and cabbage. It is often found associated with the turnip flea-beetle (*P. vittata*).

The occurrence and danger from *Pantomorus fulleri* in Italy, A. RAZZAUTI (*Bol. Lab. Zool. Gen. e Agr. R. Scuola Sup. Agr. Portici*, 7 (1913), pp. 113-124, figs. 7; *abs. in Rev. Appl. Ent.*, 2 (1914), Ser. A, No. 6, pp. 346, 347).—A summarized account of Fuller's rose beetle *P. (Aramigus) fulleri*, including descriptions of its several stages, geographical distribution, food plants, and methods of control. This pest, first collected in Italy in Liguria in 1898, has since been found at Leghorn, and at Palermo, Sicily.

The strawberry root weevil (*Otiorhynchus ovatus*) in British Columbia with notes on other insects attacking strawberry plants in the lower Fraser Valley, R. C. TREHERNE (*Canada Expt. Farms Bul.* 18 (1914), 2. ser., pp. 44, figs. 9).—This is a more detailed account of the author's investigations of *O. ovatus* than that previously noted from another source (*E. S. R.*, 30, p. 58).

Among the other pests upon which brief notes are given are *O. sulcatus*, which apparently does not occur in the Northwest in sufficient numbers to cause marked injury to strawberries; a lepidopteran (*Aristotelia* sp.), larvae of which attack the crowns of strawberry plants, which has been a source of some injury in the vicinity of Vernon; the bronze flea-beetle (*Haltica evicta*), which was abundant on strawberry leaves at Nelson in 1910; a carabid *Harpalus* sp., adults of which devour the ripe fruit; wireworms, which are commonly found in a strawberry plantation; the western lined June beetle (*Polyphylla decemlineata*), which has been reported to be a source of injury; a geometrid (*Mesoleuca truncata*), the larva of which has been recorded as destructive to the strawberry; cutworms, *Scopelosoma tristigmata* and the black cutworm; and the western strawberry crown borer (*Tyloderma foveolatum*), an account of which has been previously noted (*E. S. R.*, 10, p. 866).

Fourth annual report of the state inspector of apiaries, B. N. GATES (*Agr. of Mass.*, 61 (1913), pp. 269-284, pls. 2).—This is a brief report of the work of apiary inspection during the year. Articles on (1) Soft Candy for Bees. The So-called "Fuller Candy" for Queen Cages, Transportation of Combless Colonies, and Stimulative and General Feeding; and (2) An Inquiry into the Spraying Laws of North America in Their Relation to Beekeeping Interests, are appended.

Bees visiting *Helianthus*, T. D. A. COCKERELL (*Canad. Ent.*, 46 (1914), No. 12, pp. 409-415).—The author reports upon the bees that visit species of annual and perennial sunflowers of the genus *Helianthus*, *Andrena helianthi* being thought to be the most important. It is pointed out that the common sun-

flower, *Helianthus annuus*, is wholly sterile with its own pollen and has to be visited by insects in order to produce seeds, and that presumably the same is true with other species of the genus.

A species of *Megastigmus* reared from larch seeds, S. MARCOVITCH (*Canad. Ent.*, 46 (1914), No. 12, pp. 435-438, figs. 8).—*Megastigmus laricis*, a chalcidid reared from seeds of the larch. (*Larix laricina*) at Ithaca, N. Y., in September, 1913, is described as new to science.

The insect galls of Cedar Point and vicinity, P. B. SEARS (*Ohio Nat.*, 15 (1914), No. 2, pp. 377-392, figs. 63).—A synonymic list with brief descriptions and pen illustrations of 63 galls, many of which are common throughout Ohio.

Three new Hymenoptera, J. C. CRAWFORD (*Insecutor Inscitiæ Menstruus*, 2 (1914), No. 3, pp. 36-38).—*Pachyneuron hammari*, reared from codling moth material at Roswell, N. Mex.; *Cyrtogaster glasgowi*, reared from puparia of *Brachydeutera argentata* at Urban, Ill.; and *Pleurotropis testaceipes*, reared from a leaf miner on an undetermined plant at Batesburg, S. C., are described as new.

A revision of the braconid genus *Urosigalphus*, J. C. CRAWFORD (*Insecutor Inscitiæ Menstruus*, 2 (1914), No. 2, pp. 22-27).—In his revision of this genus of parasites the author presents a table for the separation of 13 species of which 8 are described as new to science.

Report of field entomologist Fullaway on his expedition to Africa, D. T. FULLAWAY (*Hawaii. Forester and Agr.*, 11 (1914), No. 12, pp. 349, 350).—A brief statement of the success attained in the introduction of fruit fly parasites into Hawaii.

Some observations on the salivary secretion of the commoner bloodsucking insects and ticks, J. W. CORNWALL and W. S. PATTON (*Indian Jour. Med. Research*, 2 (1914), No. 2, pp. 569-593, pls. 2).—A report of studies of a number of hematophagous arthropods.

Tea and citrus mites, A. RUTHERFORD (*Trop. Agr. [Ceylon]*, 42 (1914), No. 3, pp. 225-229).—Notes are presented on *Brevipalpus obovatus*, a common and widely distributed tea pest; *Tetranychus bioculatus*, which apparently is the least injurious of the mites attacking tea in Ceylon; and *T. mytilaspidis*, which the author reports having been recently found on citrus in Ceylon.

Cactus solution as an adhesive in arsenical sprays for insects, M. M. HIGH (*U. S. Dept. Agr. Bul.* 160 (1915), pp. 20).—In searching for an adhesive for use with arsenicals, the author's attention was directed to the prickly pear (*Opuntia lindheimeri*) which is used by Mexicans to promote adhesiveness in whitewash. This cactus, which contains a high fluid content and is very mucilaginous, is sliced several hours previous to the application and placed in the water or lime mixture.

In the author's control work with the belted cucumber beetle (*Diabrotica balteata*) tests were made of the adhesive action of a cactus solution on Paris green, lead chromate, zinc arsenite (in both paste and powder forms), lead arsenate, ferrous arsenate, and iron arsenite. A comparative test of cactus and whale oil soap as adhesives resulted in favor of the former.

Experience indicates that 15 lbs. of cactus with spines, which is preferable to the spineless, is the proper proportion to use with 50 gal. of water. By the use of cactus solution as an adhesive not only do the arsenicals give better and more lasting results, but considerable expense may be saved through the use of the powdered form. Copper sulphate may be used as a preservative for the cactus solution.

The author's experiments show that the beetle can be best controlled by spraying with zinc arsenite or with Paris green. The other arsenicals employed,

while effecting a control in most cases, did not give as high mortality as these two.

The use of cactus solution is applicable to regions where prickly pear is easily obtainable and for the treatment of insects of related habits, such as the striped and twelve-spotted cucumber beetles, etc.

FOODS—HUMAN NUTRITION.

Text-book of the chemistry, bacteriology, and technology of foods and condiments for students, veterinaries, food chemists, physicians, and pharmacists and for use in technical and agricultural high schools, A. KOSSOWICZ (*Lehrbuch der Chemie, Bakteriologie, und Technologie der Nahrungs und Genussmittel für Studierende tierärztlicher, technischer, und landwirtschaftlicher Hochschulen, Nahrungsmittelchemiker, Mediziner, und Pharmazeuten. Berlin: Borntraeger Bros., 1914, pp. VI+557, figs. 225*).—As the title implies, this book is designed as a text-book for the study of foods from the standpoints of chemical composition, manufacture, preparation, and preservation. In addition to the chemistry and bacteriology of the subject, the mechanical aspect of food preparation is also considered somewhat at length, and a great many illustrations are given of different machines employed in the food industries.

The most important food materials considered are the following: Meat and meat products, milk and dairy products, fats and oils, cereals and cereal products, fruits and fruit products, sugar, chocolate and chocolate products, and tea, coffee, and other beverages, both alcoholic and nonalcoholic.

Household chemistry, J. KLEIN (*Chemie in Küche und Haus. Leipsic: B. G. Teubner, 1914, 3. ed., pp. VI+136+16*).—This book presents briefly the fundamental principles of general chemistry and treats somewhat at length of the chemistry of foods and cooking, together with the biochemistry of fermentation, preservation, and disinfection. There is also a chapter on heating and lighting which discusses the chemistry of these subjects.

The pure food cookbook, MILDRED MADDOCKS (*New York: Hearst's International Library Co., 1914, pp. VIII+417, figs. 85*).—In addition to a large number of recipes, this book contains sample menus and a chapter on the planning of meals. An introductory chapter by H. W. Wiley, with notes on foods and food values by the same author, is also included. A chapter is devoted to advice regarding the selection and making of coffee.

The physical character of the curd of milk from different breeds.—Curd as an index of the food value of milk.—Studies of the proteid content of milk, S. S. BUCKLEY (*Maryland Sta. Bul. 184 (1914), pp. 227-242*).—The greater part of this publication consists of a report of an investigation of the protein reactions with precipitating reagents in the case of milks from Holsteins, Ayrshires, Jerseys, and Guernseys. Some comparative tests were also made with milks of other species (human, mule, and goat) and with abnormal cow's milk. A discussion of the relation of this study to the digestion and assimilation of raw milk by infants concludes the report. In this connection the following quotations are of interest:

"Milks may have been found to have been produced under perfect conditions as far as the food of the cow and the proper care of the milk are concerned; both may have been shown to contain normal amounts of the several constituents; in fact, they may have tested alike in the content of fat and other solids, yet the results of feeding it to infants are widely different.

"The breed of the cow may be the only recognizable factor in which a difference [in digestibility] could exist, and yet there has been no measurable differ-

ence in the character of the constituents recognized, except the size of the fat globules and the flocculence of the curd.

"The size of the fat globules would not seem to be an important factor in itself, for the reason that in most all cases where an infant has failed to thrive upon a particular milk and is unable to digest and retain it it is possible to give the cream from such milk with satisfactory results. Furthermore, the size of the fat globules in human milk range in size from the smallest found in cow's milk to the largest found in cow's milk, and averages about midway between the Holstein-Ayrshire class and the Jersey-Guernsey class.

"The flocculence of the curd has been claimed for some time by the advocates of the Holstein and Ayrshire breeds of cows to be especially desirable for milks for infant feeding. The results of the work done in connection with the reactions of the proteids in the presence of precipitating solutions confirm the claims of these in regard to the flocculent nature of the curds and in addition show that the milks of these two breeds are not so easily curdled with the natural acid of the stomach as are those of the Jersey and the Guernsey breeds.

"The results of the work done on abnormal milks are not sufficient to draw conclusions from, nevertheless they indicate an important line of observation. It may prove possible by such reactions to determine exactly what period after calving and what time at the end of the lactation period is necessary to elapse before the milk of such cows is proper for food."

Beef frozen for 18 years, G. T. BURROWS (*Breeder's Gaz.*, 66 (1914), No. 13, p. 484, fig. 1).—Note is here made of a quarter of beef which was kept frozen for 18 years, and at the end of that time showed no indication of putrefaction. The fibers of the meat on microscopical examination appeared normal, and the meat was consumed without any signs of digestive disturbance. It is stated that one reason why this meat maintained its good condition was that it had not been kept in a chamber in and out of which other beef was passing.

Growth in meat of bacilli causing food poisoning, E. SACQUÉPÉE (*Compt. Rend. Soc. Biol. [Paris]*, 75 (1913), No. 34, pp. 490-492).—An experimental study was made of the growth of organisms of the Gärtner type upon the surface of meat as well as of the rapidity with which they penetrated its interior. The growth upon the surface was found to be much the more rapid. At 37° C. the bacilli growth over the surface was found to have spread in 24 hours to a distance of from 10 to 12 cm. from the point of infection, while under the same conditions it penetrated into the interior to a depth of only 4 cm. from the point of infection.

Growth of these organisms on the surface was found to be most favorable when the surrounding temperature was about 37 and when there was little evaporation. On the other hand, very little development was observed when the surrounding temperature was low and when there was considerable evaporation.

The identity of starches of different origin, C. TANRET (*Compt. Rend. Acad. Sci. [Paris]*, 158 (1914), No. 19, pp. 1353-1356; *abs. in Chem. Zentbl.*, 1914, II, No. 1, p. 51).—To determine whether or not starches of different origin are identical, the author determined the amounts of amylopectin and amylase present in the starches prepared from cereal grains, legumes, chestnuts, apples, bananas, and potatoes. Since these constituents were present in different proportions and showed unequal solubilities in boiling water, the author concludes that starches of different origin are not of uniform composition.

Variations in gluten, MARCHADIER and GOUJON (*Jour. Pharm. et Chim.*, 7. ser., 10 (1914), No. 5, pp. 191-202).—The author has attempted to account for the curious color changes taking place when flour from wheat is compounded

with that of other grains. Analyses of different grains are given, with particular reference to the glutenin-gliadin ratio. The germination, milling, storage, and temperature are factors affecting the quality and quantity of coagulable gluten, but acidity of the grain is most important in regulating the glutenin-gliadin ratio.

Maize products as human food, F. FIDANZA (*Ann. Ig. Sper., n. ser., 24* (1914), No. 3, pp. 507-517).—The results are reported in detail of experiments which tend to show that, considered from the standpoint of the utilization of protein, maize products have an inferior value to those of wheat and other cereals. This inferiority was manifested not only in the case of persons who are unaccustomed to a maize diet but also in the case of those who are accustomed to such a diet.

Food products from the soy bean, H. M. LOOMIS (*Amer. Food Jour., 9* (1914), No. 8, pp. 472-475, fig. 1).—The method of preparation of a number of Japanese food products is described, including shoyu or soy sauce, tofu or soy bean curd, soy bean oil, and miso, a fermented product. A table is given showing the chemical composition of these products. The paper is followed by a discussion.

On the occurrence of creatinin in leguminous seeds, K. OSHIMA and M. ARIZUMI (*Jour. Col. Agr. Tohoku Imp. Univ., 6* (1914), No. 2, pp. 17-25).—In these experiments a number of different methods were applied to determine the presence of creatinin in various legumes. It was found to be present in the seeds of the Adzuki bean, kidney bean, and soy bean in small amounts, and in the horse bean and in green peas in even lesser quantities.

Gray honey, C. REESE and J. DROST (*Ztschr. Untersuch. Nahr. u. Genussmtl., 28* (1914), No. 3, pp. 150-154).—The properties of this substance are described and some information is given regarding the so-called "sugar-layer," which may develop in honey on long standing.

Recipes for the use of potatoes and potato products in cookery (*Ztschr. Landw. Kammer Schlesien, 18* (1914), No. 38, pp. 1484, 1485).—Notes are given concerning the use of potato flour.

Uses of fruit from domestic science viewpoint, A. B. MILAM (*Ann. Rpt. Oreg. State Hort. Soc., 5* (1914), pp. 79-81).—A brief preliminary note is made of experiments which are being carried out to determine the comparative cooking qualities of different varieties of apples, grapes, pears, etc., at certain seasons of the year.

Recipes for the preparation of simple fruit dishes, M. PFEIFER (*Ztschr. Obst u. Gartenbau, 40* (1914), No. 9, pp. 130-133).—Several examples are given to illustrate the manifold possibilities of the fruit compote.

Roselle recipes, P. J. WESTER (*Philippine Agr. Rev. [English Ed.], 7* (1914), No. 5, pp. 239-241).—In this article recipes by E. L. Worcester are given for the preparation of a number of dishes flavored with roselle sirup and roselle jelly. For earlier work see a previous note (*E. S. R., 29*, p. 566).

Indian chutneys, pickles, and preserves (*Calcutta: Thacker, Spink & Co., 1914*, pp. 92).—A compilation of recipes.

Salads, sandwiches, and chafing-dish dainties, JANET MCK. HILL (*Boston: Little, Brown & Co., 1914*, rev. ed., pp. XVII+231, pls. 38).—A compilation of selected recipes with hints on serving. Special attention is given to the preparation of decorative dishes.

Rigby's reliable candy teacher (*Topeka, Kans.: Rigby Publishing Co., 1914*, 11 ed., pp. XXXI+222, pl. 1).—General directions for candy making, recipes, formulas, and hints regarding the display of candy are contained in this book.

Confectionery (marshmallows), A. MCGILL (*Lab. Inland Rev. Dept. Canada Bul. 292* (1914), pp. 11).—The results are presented of the inspection and

analysis of 93 samples of marshmallows, which were examined especially for their content of sulphurous acid and sulphites, sometimes added to produce the desired whiteness. The quantity of sulphurous acid present in no case exceeded 1 part in 2,000 by weight, which is regarded as harmless to health.

A sanitary code for bottlers (*Pure Products*, 10 (1914), No. 11, pp. 546-549).—The text is given of a code issued by the Agricultural Commission of the State of Ohio for the conduct of places where soft drinks are prepared.

Concerning nickel cooking vessels (*Pure Products*, 10 (1914), No. 11, pp. 543, 544).—This note states that the solubility of nickel varies according to its method of manufacture.

The following figures show the quantities of nickel per square meter of surface dissolved by sulphuric acid: Rolled nickel, 15.5 to 16.9 mg.; cast nickel, 25.5 to 28.8 mg.; electrolytic nickel, 30.6 to 30.8 mg.; drawn nickel, 33.1 to 39.0 mg.; and pure nickel, 61.4 to 65.5 mg.

The diet, its composition, and influence on the health, with special reference to the mineral constituents, R. BERG (*Die Nahrungs und Genussmittel, ihre Zusammensetzung und ihr Einfluss auf die Gesundheit, mit besonderer Berücksichtigung der Aschenbestandteile*. Dresden: Holze & Pahl, 1913, pp. 60; rev. in *Zentbl. Biochem. u. Biophys.*, 17 (1914), No. 3-4, p. 159).—This book contains data regarding the ratio of the acid and basic mineral constituents of foods and is based on the theory that the diet should contain more than enough inorganic bases to neutralize the inorganic acids. Some of the data is the result of original work, but the greater part has been compiled from various sources.

The derangement of the skeletal system by a diet poor in phosphorus, M. MASSLOW (*Biochem. Ztschr.*, 64 (1914), No. 1-3, pp. 106-110).—The results of a microscopical examination of bones strengthen the author's conclusions, drawn from previous work (*E. S. R.*, 30, p. 669), that a deficiency of phosphorus in the diet plays a definite part in pathogenic disturbance of the bones.

The distribution of phosphorus in striated muscle, A. E. RABBENO (*Arch. Farmacol. Sper. e Sci. Aff.*, 18 (1914), No. 3, pp. 97-106).—From the examination of several samples of strained muscle, from both human and animal sources, the author concludes in part that the inorganic phosphorus makes up about 65 per cent of the total phosphorus content of the muscle. The nucleo portion of organic phosphorus is greater than the portion outside the nucleus.

Maintenance of mice on a diet composed of simple foods, F. RÖHMANN (*Biochem. Ztschr.*, 64 (1914), No. 1-3, pp. 30-62, figs. 23).—A series of experiments was conducted to determine the relative nutritive values of protein containing phosphorus and phosphorus-free protein. A large amount of experimental data is given, from which the following conclusions are drawn.

Phosphorus-containing protein is not absolutely necessary in the diet. Such compounds found in the body cells may be synthesized in the animal organism. Purin bases such as lecithin may be similarly formed.

The relations of vitamins to lipoids, EVELYN A. COOPER (*Biochem. Jour.*, 8 (1914), No. 4, pp. 347-354).—The results are reported of investigations regarding experimental beri-beri from which the conclusion is drawn that vitamins do not enter into the constitution of the lipoids of brain and muscle but may be absorbed by them and stored until needed by the organism. The deleterious effects of lipoid-free diets observed by some workers are attributed by the author to mechanical removal of vitamins by alcohol-ether extractions rather than to a deficiency of lipoids.

Studies of a qualitatively insufficient diet, S. OSEKI (*Biochem. Ztschr.*, 65 (1914), No. 1-2, pp. 158-176).—Feeding experiments with laboratory animals

(mice) carried out to contribute to the knowledge of vitamins and lipoids may be summarized as follows:

Rye bread prepared with water was found to have a greater nutritive value than bread prepared from fine wheat flour and water. The nutritive value of the wheat bread was greatly increased and in some instances made to equal that of rye bread by an addition of milk, pressed lees, rye bran, wheat bran, or extracts prepared from army bread. Since these constituents of rye bread, which are necessary for the maintenance of life, dissolve readily in water but can not be extracted with alcohol and ether, they can not be identified with the lipid-like nutrients of milk.

Study of the diet of laborers in a district of Spain, I. G. COLMENARES (*Bol. Agr. Téc. y Econ.*, 6 (1914), No. 69, pp. 833-838).—The author reports the results of observations regarding the diet of laborers. This diet is found to be deficient in protein, in fat, and in carbohydrates.

[Army rations] (*Pure Products*, 10 (1914), No. 11, pp. 545, 546).—Notes are given of the minimum daily rations supplied to the French, German, and Belgian soldiers.

Subsistence Supplies Branch [Office of U. S. Quartermaster General] (*War Dept. [U. S.], Rpt. Quartermaster Gen.*, 1914, pp. 12-18).—On the basis of experience some information is given regarding the use of dehydrated vegetables. Field bread, rolling kitchens, cooking outfits for Philippine scouts, and field cooking utensils are discussed. Statements are made regarding the extension of schools for army bakers and cooks.

Brief reference is also made to studies of emergency rations undertaken for the War Department by the Nutrition Investigations of the U. S. Department of Agriculture. It is pointed out that digestion experiments with an emergency ration of which chocolate was a component led to the conclusion that it was not suitable for this purpose. The ration was, therefore, discontinued, and experimental studies are being made with a view to finding a substitute which will fulfill the necessary conditions.

The specific dynamic action of foods, S. CSERNA and G. KELEMEN (*Biochem. Ztschr.*, 66 (1914), No. 1-3, pp. 63-74).—Intravenous injection into eviscerated animals (dogs) of substances such as urea, sodium chlorid, and dextrose produced an increase in gaseous metabolism. The authors state that this increase can not be due to the increased work of the kidneys or to acceleration of the heart action, as has been suggested by others, since different substances injected in the same quantity of liquid produced this increase in different degrees. In the light of these experiments it also appeared that the gaseous metabolism is not proportionately increased with the work of the intestines. The authors believe that the increased metabolism produced by these substances depends upon their stimulative action on the cells whereby their metabolism of matter and energy is increased.

The influence of the spleen in nutrition, C. RICHET (*Jour. Physiol. et Path. Gén.*, 15 (1913), No. 3, pp. 579-583; *abs. in Hyg. Rundschau*, 24 (1914), No. 9, p. 530).—According to the author's observations, laboratory animals (dogs) with the spleen removed required more food to maintain unchanged weight than normal animals. Therefore he concludes that the spleen plays a very important part in nutrition, aiding in the complete utilization of nutritive material.

The influence of early removal of the thyroid and parathyroid glands upon nitrogenous metabolism in the sheep, A. HUNTER (*Quart. Jour. Expt. Physiol.*, 8 (1914), No. 1, pp. 23-32).—The following conclusions were drawn by the author from the results of a study of three laboratory animals (sheep) from which the thyroid and parathyroid glands had been removed:

"These animals excrete during a fast rather more nitrogen and rather more purin derivatives, in relation at any rate to body weight, than do normal animals; are liable, although by no means certain, to succumb very early to the effects of inanition; may fail to exhibit such signs of hunger acidosis as a high output of ammonia, and the elimination of aceto-acetic acid; excrete while fasting urine which is generally alkaline and never acid; invariably react to the withdrawal of food by the excretion of creatin in excess of creatinin; exhibit in the relations of the purin catabolites no evidence of diminished oxidative power; and have a degree of sugar tolerance which is almost certainly above the normal."

The intestinal absorption of fats, K. NAKASHIMA (*Pflüger's Arch. Physiol.*, 158 (1914), No. 6-8, pp. 288-306).—The mechanism of fat digestion was studied in a series of normal feeding and injection experiments carried out with laboratory animals (mice). An examination of the blood after the injection of milk fat into the rectum and large intestine failed to indicate any absorption of the fat by the blood. Milk fat fed normally per mouth, however, appeared in the blood.

Absorption of fat in the peritoneum, K. NAKASHIMA (*Pflüger's Arch. Physiol.*, 158 (1914), No. 6-8, pp. 307-342).—In extending the work noted above, experiments were carried out in which milk fat was injected into the peritoneum. From subsequent examinations of the blood the following conclusions were drawn:

The fat is taken in corpuscular form from the peritoneum into the blood stream, the resorption taking place both in the case of cold- and warm-blooded animals. Casein is absorbed still more easily than the fat, but both appear in the blood within 20 minutes after ingestion and traces of the fat remain for 24 hours. Lecithin is absorbed slowly. Resorption of fat from the peritoneum takes place through the lymphatics.

The relation between energy metabolism and protein metabolism under fasting conditions, P. HÁRI (*Biochem. Ztschr.*, 66 (1914), No. 1-3, pp. 1-19).—The results of a large number of experiments with fasting dogs are reported in which the heat production was measured both directly and indirectly. From these results the author draws the following conclusions:

The energy metabolism computed per square meter of body surface at different temperatures varies during the first eight days of the fasting period between 700 and 1,000 kilogram-calories. This value is independent of the body weight, but varies directly with the amount of body protein. The increase of energy production depends not only upon increased protein consumption but also upon a greater combination of fat, which could be designated as the specific dynamic action of the body protein. The suggestion is offered that possibly the decomposition products of body protein in some way accelerate the combustion of the fat.

The total energy requirement in disease as determined by calorimetric observations, E. F. DU BOIS (*Jour. Amer. Med. Assoc.*, 63 (1914), No. 10, pp. 827-830, figs. 5).—Results which are of general interest are here reported of a series of experiments carried out to determine the influence of a number of diseases upon metabolism. For this purpose a respiration calorimeter of the Atwater-Rosa type, and equipped with a bed, was used. The fact is emphasized "that the nutrition of a patient depends absolutely on the relationship between his energy production and his food supply. If the organism fails to obtain food from without, it will draw on its own glycogen stores, fat depots, and supplies of body protein."

A contribution to the study of experimental beri-beri, R. MCCARRISON (*Indian Jour. Med. Research*, 2 (1914), No. 1, pp. 369-374, pl. 1).—In a labora-

tory study of experimental beri-beri in pigeons, the presence of certain bacteria was noted in the internal organs of the animals developing the disease. Inoculation of the animals with cultures of this organism produced symptoms which were indistinguishable clinically from typical polyneuritis gallinarum.

The treatment and prevention of pellagra, J. GOLDBERGER, C. H. WARING, and D. G. WILLETS (*Pub. Health Rpts. [U. S.]*, 29 (1914), No. 43, pp. 2821-2825).—An extended study of this disease tends to strengthen the conclusion that it is neither infectious nor contagious, but essentially due to some fault in the diet in which the proportion of animal or leguminous protein is abnormally small and the nonleguminous vegetable component abnormally large. Experience shows that pellagra does not develop among those who consume a mixed, well-balanced, and varied diet. The prevention of the disease depends upon the substitution of a mixed, well-balanced diet for the one-sided diet. The most important dietary change recommended is an increased use of milk, eggs, lean meat, and legumes, either fresh or dried beans and peas (not canned). A greater use of dried legumes, as a cheap and readily variable source of protein, is urged.

Protein metabolism in fever and during work—studies regarding the nitrogen minimum, R. KOCHER (*Deut. Arch. Klin. Med.*, 115 (1914), No. 1-2, pp. 82-123; *abs. in Zentbl. Biochem. u. Biophys.*, 17 (1914), No. 5-6, p. 178).—Observations upon fever patients who were given a diet which supplied 80 calories per kilogram of body weight showed the nitrogen metabolism to be excessive. With a decrease in temperature to normal the nitrogen minimum was reached. A corresponding decrease in the values of uric acid, creatinin, phosphorus, and sulphur was also noted. The author suggests that the rise in body temperature during fever may be caused by a specific action of the fever on the cell protoplasm.

The influence of the high-calorie diet on the respiratory exchanges in typhoid fever, W. COLEMAN and E. F. DU BOIS (*Arch. Int. Med.*, 14 (1914), No. 2, pp. 168-209, figs. 4).—From the large amount of experimental data obtained in 134 observations with a universal respiration apparatus upon a number of patients, the conclusions drawn are in part as follows:

"The large amount of food administered exhibits little or no specific dynamic action, thus removing the chief theoretical objection to the use of a liberal diet in typhoid fever. In the high-calorie cases approximately 10 per cent must be added to cover the increase in metabolism caused by bodily exertion incident to moving about the bed. The theoretical requirement must be exceeded by from 50 to 110 per cent in order to bring the patient into nitrogen and weight equilibrium. The fate of the excess has not yet been discovered."

Studies regarding the possibility of an inversion of the daily temperature curve of man, O. POLIMANTI (*Ztschr. Allg. Physiol.*, 16 (1914), No. 3-4, pp. 506-512, figs. 2).—Observations of the variations, during the 24-hour cycle, in body temperature of a man, who for a period of six years had worked nights and slept days, showed no tendency for a reversion of the normal temperature curve. The temperature curve in this case was essentially the same as that of a man of normal habits.

The effect on man of winter climbing in high altitudes, N. ZUNTZ (*Separate from Ztschr. Balneol., Klimat. u. Kurort Hyg.*, 6 (1913-14), No. 18, pp. 3).—The author took the opportunity presented by a walking trip up the Brocken during the winter of 1913 to collect data regarding the effect of severe exercise in cold weather at high altitude. Thirty-one members making the trip filled in questionnaires regarding the effects of the exercise on muscles, breathing, heart action, skin, etc. The weather on the day of the climb was cold and windy, and during the descent there was a severe snowstorm.

Data are given regarding the effects of the exertion on men of different ages and previous training, from which the author concludes that even very severe and unusual body exertion combined with great demands on the heat regulating machinery of the body does not as a rule produce any deleterious results. On the contrary, it induces good sleep and a feeling of refreshment even in persons little used to walking. The men in good training and general condition undoubtedly had the advantage during the ascent, but the final results were favorable also for those to whom the ascent was difficult or even painful.

The study seems to prove that to include considerable muscular exertion in a winter vacation trip raises the general tone of the body by strengthening the heart and improving the vasomotor activity.

A method for the study of the periods of rest and activity of laboratory animals. J. S. SZYMANSKI (*Pflüger's Arch. Physiol.*, 158 (1914), No. 6-8, pp. 343-384, figs. 35).—A detailed description is given of a delicate modification of the kymograph which the author employed in the study of a number of small laboratory animals (such as goldfish, canary birds, etc.) during day and night. A diagrammatic explanation of the modification is given.

On the respiratory exchange in fresh water fish.—I, On brown trout, J. A. GARDNER and CONSTANCE LEETHAM (*Biochem. Jour.*, 8 (1914), No. 4, pp. 374-390, figs. 2).—Detailed descriptions are given of apparatus and experimental technique. The data reported may be summarized as follows:

Oxygen absorption was approximately proportional to the body weight at a given temperature and yielded a respiratory quotient of about 0.8. The considerably lower respiratory quotient noted at low temperatures is explained by the authors on the theory that at low temperatures the animals are in a state of hibernation or starvation and live on their fat, partially converting it into glycogen and sugar.

Laboratory experiments with air, F. S. LEE (*Jour. Amer. Med. Assoc.*, 63 (1914), No. 19, pp. 1625-1628).—In this summary of the contributions of his laboratory to the knowledge of air in relation to ventilation problems the experiments being carried out by the New York State Commission on Ventilation are very briefly described.

In these experiments one group of laboratory animals (cats) was kept for a period of 6 hours at a temperature of 21° C. (70° F.) and in an atmosphere of 54 per cent humidity. Another group of animals was kept under conditions of humidity as high as 89 per cent at temperatures as high as 33°. Under these conditions, which were comparable with those of a hot and humid summer day, the body temperature rose on an average of 0.5° during the 6-hour period. At the end of this time stimulation of certain muscles of the animals showed that they were able to perform only an amount of work which was 14, 18, and 26 per cent less than was the case with animals of the first group which had been kept under more favorable atmospheric conditions. A diminution of 13 per cent in the blood sugar was also noted. Further experiments are being carried on along this line.

[Report of the work of the] nutrition laboratory, F. G. BENEDICT (*Carnegie Inst. Washington Year Book*, 12 (1913), pp. 241-254).—Notes of changes and improvements of equipment, brief general descriptions of the various metabolism experiments in progress, and brief reviews of the publications issued during the year 1913 are given.

International catalogue of scientific literature. Q—Physiology. QR—Serum physiology (*Internat. Cat. Sci. Lit.*, 10 (1914), pp. VIII+1155, V+182+36).—This volume, like the preceding ones (*E. S. R.*, 20, p. 1168), contains references to scientific articles on subjects regarding general physiology, including among other subjects those of respiration, heat production, digestion, absorption, and metabolism.

ANIMAL PRODUCTION.

[Animal production], VON OLLECH (*Jahresber. Landw.*, 28 (1913), pp. XXVI-XLI, 299-496).—A compilation of abstracts of German articles on various phases of animal production and dairying published during 1913 and previously reported from other sources.

Record of proceedings of the annual meeting, December, 1913, of the American Society of Animal Production (*Amer. Soc. Anim. Prod. Proc.* 1913, pp. 39, figs. 6).—This gives the proceedings of the annual meeting held in Chicago, December 3, 1913, previously referred to (E. S. R., 30, p. 99).

Acidosis in omnivora and herbivora and its relation to protein storage, H. STEENBOCK, V. E. NELSON, and E. B. HART (*Jour. Biol. Chem.*, 19 (1914), No. 3, pp. 399-419).—The authors summarize the results of their studies as follows:

"Acid rations fed to swine (omnivora) or calves (herbivora) occasion a rise in urinary ammonia with a compensative fall in output of urea. Presumably on a normal level of protein intake a part of the ammonia produced either in the intestine or liver combines with acids and is excreted as the salts of these acids. This power to help maintain neutrality by the production or use of ammonia is apparently very general in all mammals. Ammonia production, under conditions of exogenous protein metabolism, does not occasion an increased nitrogen excretion or an interference with protein storage.

"In herbivora (calves) approximate endogenous nitrogen metabolism, accompanied by mineral acid ingestion, likewise occasions a rise in urinary ammonia, but does not, on the level of acid used, cause a rise in protein catabolism, as has been observed with dogs and swine. This may be due in this experiment to a greater dilution of the ammonium salts incident to a large consumption of water by this class of animals.

"Data are also given on calcium and phosphorus metabolism during both neutral and acid periods of low nitrogen intake, as well as on a period of high nitrogen intake. Very probably the skeleton was not drawn upon for calcium during the period of lowest acid ingestion. Only on a high acid ingestion did it appear probable that decalcification of the bones began and then only a withdrawal of calcium carbonate.

"From the records submitted on growth and reproduction, it is believed that natural acid rations, if otherwise satisfactory, are as effective for growth or reproduction as those of basic character. However, until it has been shown conclusively that less vigorous individuals will tolerate acid rations with perfect impunity, we are not warranted in making too sweeping conclusions."

The value of acorns, horse chestnuts, and beech mast as food for stock (*Jour. Bd. Agr. [London]*, 21 (1914), No. 6, pp. 511-528).—A general summary of material collected from other sources on the value of these products for stock.

Calcium phosphate in the rations of domestic animals, J. DENAYRE (*Handel. Vlaamsch Natuur en Geneesk. Cong.*, 17 (1913), pp. 218-222).—Data are cited tending to show that the addition of calcium phosphate to the ration increases the height, weight, and general conformation of young growing horses.

The feeding value of pastures.—An experiment with different grass-seed mixtures, J. HENDRICK and W. M. FINDLAY (*Trans. Highland and Agr. Soc. Scot.*, 5. ser., 26 (1914), pp. 195-211).—Four pasture lots were calculated to contain 59.3, 64.5, 67.1, and 40 per cent, respectively, of white clover. In addition lot 1 had 37.9 per cent perennial rye grass; lot 2, 25.8 per cent perennial rye grass and approximately 9 per cent cocksfoot and timothy; lot 3, 19.5 per cent cocksfoot and 10.4 per cent timothy; and lot 4, 18.7 per cent cocksfoot, 11.2 per cent timothy, and 20.9 per cent tall oat grass.

During 1912 these plats were pastured with sheep. The average weight of sheep carried per acre on the several plats was 440, 460, 489, and 441 lbs., respectively, and the average increase per sheep in 16 weeks was 43.9, 45.2, 51.5, and 42.6 lbs.

During 1913 these plats were pastured to cattle in the early part of the season and sheep in the fall. The average increase per acre for the 3-months' cattle feeding was 233, 271, 254, and 295 lbs., respectively. The average weight of sheep carried per acre was 239, 189, 184, and 188 lbs., and the average increase per sheep during 10 weeks pasturing was 11.5, 16.8, 15, and 12.6 lbs., respectively. The total value of produce per acre for the one year of haying and two years of pasturing was £15 6s. 11d., £16 5s. 1d., £16 7d., and £14 16s. 7d. The results obtained from these plats for the three years show, as a whole, that a heavy seeding with rye grass, such as was given plat 1, is not superior to a lighter seeding, such as was given plat 2, or to a mixture without rye grass, such as that of plat 3.

Chemical composition of moor hay causing excessive licking in cattle, H. VON FEILITZEN (*Svenska Mosskulturför. Tidskr.*, 28 (1914), No. 2, pp. 155-161; *abs. in Internat. Inst. Agr. [Rome], Mo. Bul. Agr. Intel. and Plant Diseases*, 5 (1914), No. 8, pp. 1002, 1003).—Samples of moor hay which caused an excessive desire to lick in cattle were analyzed and found to contain a larger quantity of sodium and chlorin than other hays, thus no doubt furnishing salt desired by the cattle.

Modern silage methods, W. L. WRIGHT (*Salem, Ohio: The Silver Manufacturing Co., 1914, 10. ed. rev., pp. 264, figs. 77*).—General information on methods of ensiling crops and their feeding to farm animals.

The ensiling of beet tops with lactic acid bacteria, D. MEYER (*Landw. Wehnschr. Sachsen*, 16 (1914), No. 26, pp. 231, 232).—In experiments in which beet tops were ensiled for 160 days, with and without the use of a lactic acid culture, it was found that the loss of nutrients was in all cases greater in that material ensiled without the use of the culture than that to which it was added. The addition of the culture improved the aroma and palatability of the silage.

The ensiling of potatoes with a lactic acid culture, D. MEYER (*Landw. Wehnschr. Sachsen*, 16 (1914), No. 12, pp. 106, 107).—It is stated that potatoes may be ensiled with less fermentation loss by the use of lactic acid culture. It is estimated that the loss in dry matter is 4.9 per cent, in protein none, in nitrogen-free matter 5.6 per cent, and in fiber 21.8 per cent. The ferment used for this purpose is *Bacillus delbrücki* in the case of steamed potatoes, and for raw potatoes and roots *B. cucumeris fermentati*. The ensiled product is high in sugar content and is valuable for all kinds of stock.

Ensiling potatoes (*Ztschr. Landw. Kammer Schlesien*, 18 (1914), Nos. 38, pp. 1485, 1486; 39, pp. 1505, 1506).—Directions are given for the ensiling of both raw and cooked potatoes. A lactic acid culture is added to hasten the fermentation process. It is stated that horses, cattle, and sheep can use 40 kg. of this material per 1,000 kg. live weight per day, while fattening hogs use a smaller quantity.

The utilization of marc for the feeding of cattle, L. DEGRULLY (*Prog. Agr. et Vit. (Ed. l'Est-Centre)*, 35 (1914), No. 37, pp. 300-303).—A summary of data based largely on the work of Fabre previously noted (*E. S. R.*, 21, p. 667). It is suggested that from 10 to 12 kg. per day may be fed to horses and mules together with bran and a small quantity of water, 20 to 25 kg. to cattle, 5 to 6 kg. to sheep, and 5 to 10 kg. to swine.

Molasses and molasses feeds, J. E. HALLIGAN (*Baton Rouge, La.: Bd. Agr. and Immigr. [1914], pp. 2-12, fig. 1*).—An account of the composition and feeding value of cane and sugar-beet molasses, and of various molasses-mixed feeds.

There are also included analyses of rice polish, rice bran, rice straw, and rice hulls, together with suggestive rations containing rice products for fattening cattle, dairy cows, hogs, mules, and horses.

Commercial feeding stuffs of Pennsylvania in 1913; their chemical and microscopical examination, J. W. KELLOGG (*Penn. Dept. Agr. Bul. 249 (1913), pp. 189*).—Analyses are given of the following feeding stuffs: Cotton-seed meal, linseed meal, dried brewers grains, gluten feed, middlings, molasses feeds, dried beet pulp, corn chop, beef scrap, malt sprouts, buckwheat products, rye products, alfalfa meal, and various mixed and proprietary feeds.

Breeds of beef cattle, W. F. WARD (*U. S. Dept. Agr., Farmers' Bul. 612 (1915), pp. 23, figs. 18*).—This bulletin is a discussion of the breed characteristics and utility value of the several breeds of beef and of dual-purpose cattle.

The inheritance of twin calving in cattle, E. UHLMANN (*Deut. Landw. Tierzucht, 18 (1914), No. 14, pp. 163, 164*).—In commenting on the inheritance of twin calving in cattle, an instance is given in which a cow gave birth to twins. In the third generation, of the four heifers born, two gave birth to six pairs of twins, and in the fourth generation two pairs of twins were born.

Corn silage compared with hulls for fattening steers, E. R. LLOYD (*Mississippi Sta. Bul. 167 (1914), pp. 3-8*).—Four lots of six 4 to 5-year-old native grade steers were fed 142 days, beginning December 1, as follows: Lots 1 and 2, cotton-seed meal, Johnson grass hay, and corn silage; lots 3 and 4, cotton-seed meal, Johnson grass hay, and cotton-seed hulls. Lots 1 and 3 were confined under shelter, lots 2 and 4 had the run of the paddock. The average daily gains per head were 0.77, 1.1, 1.13, and 1.38 lbs., respectively; the shrink in shipping 4.65, 4.65, 5.42, and 5.42 per cent; the cost per pound of gain 18.81, 11.12, 14.06, and 14.06 cts.; the dressing percentage 59.32, 59.32, 59.01, and 59.01 per cent; and the profit per steer (manure not included) \$12.25, \$15.87, \$18.92, and \$22.07.

The manure from the silage-fed steers analyzed as follows: Moisture 74.73 per cent, nitrogen 0.69, potash 0.76, and phosphoric acid 0.63; that from the hull-fed steers, 78.5, 0.57, 0.61, and 0.38 per cent, respectively. That from the former was estimated to be worth \$4.32 per ton and that from the latter \$5.41 per ton.

Two lots of twelve 4 to 5-year-old steers of grade Jersey blood were fed silage and cotton-seed meal and hulls and cotton-seed meal, respectively. The average daily gains per head were 1 and 1.19 lbs.; shrinkage in shipping, 3.23 and 3.58 per cent; cost per pound of gain, 13.14 and 12.38 cts.; dressing percentage, 58.05 and 58.4 per cent; and profit per steer, \$18.42 and \$19.50, respectively.

The feeding and care of dairy calves (*U. S. Dept. Agr., Office Sec. Spec. [Circ.], 1914, Dec. 19, pp. 4*).—Popular suggestions on calf feeding, with special reference to cotton-belt conditions.

Sheep grazing on ditches infested with Johnson grass, F. W. WILSON (*Arizona Sta. Rpt. 1913, pp. 268, 269*).—From experiments conducted in cooperation with the U. S. Reclamation Service it was found that the grazing of sheep on irrigation ditches infested with Johnson grass lessened the stand of grass; the ditch banks were well packed; the gopher holes and gophers seemingly had disappeared; the sheep had been maintained; the expense of controlling the seeding of Johnson grass was cut to a minimum; and the cost of ditch cleaning was decreased.

Producing sheep on southern farms (*U. S. Dept. Agr., Office Sec. Spec. [Circ.], 1914, Nov. 30, pp. 3*).—General suggestions are given.

Swine investigations, F. C. MINKLER (*New Jersey Sta. Rpt. 1913, pp. 181-199, pls. 5; Circ. 40 (1914), pp. 3-21, pls. 5*).—This treats of the breeding, feeding, care, and management of swine under New Jersey conditions.

In trials to determine the adaptability of alfalfa for pasturing and growing swine, it was found that 2½ acres of alfalfa, not in average condition, furnished forage for 10 head of brood sows and 79 pigs from May 1 to October 1. The sows suckling pigs were fed in addition a ration made up as follows: Corn meal, 100 lbs.; tankage, 12; wheat bran, 10; and oil meal, 4. The pigs were fed limited quantities of skim milk and started on a grain mixture of red dog flour, 100 lbs.; crushed oats, 100; and tankage, 10, with a small quantity of soaked shelled corn. The sows gained slightly in total weight during the season, while the pigs averaged gains of 1.12 lbs. per day from birth until removed to the fattening pens. Without allowing for the hay harvested, the maintenance of the 10 brood sows, and deducting the cost of grain and value of the milk fed, the alfalfa was responsible for approximately 460 lbs. of pork per acre.

Two lots of 7 148-lb. fall shoats each were fed for 30 days beginning May 1 as follows: Lot 1, corn meal and steamed kidney-bean meal, with alfalfa pasture; lot 2, corn meal and bean meal, with skim milk. Lot 1 made an average daily gain per head of 1.63 lbs., lot 2, 1.14. The cost per pound of gain was, for lot 1, 4.3 cts., for lot 2, 7.1 cts. On this basis the forage value of the alfalfa eaten was estimated to be \$21 per acre per month. The alfalfa-fed pigs, which were in a later experiment confined in a dry pen, continued to make more rapid gains than those of lot 2.

Ten 112-lb. pigs were turned into a half-acre of corn to hog down. They cleaned up the plot in 16 days, making an average daily gain per head of 2.27 lbs. Rape and red clover had previously been seeded in the corn and furnished forage for the pigs. On this basis the corn was estimated to be worth \$68.20 per acre.

Six lots of 2 pigs each, weighing approximately 200 lbs., were selected for use in an experiment to determine the palatability and feed value of the refuse product known as garbage tankage. They were fed for 40 days as follows: Lot 1, corn meal and skim milk, 10:25; lot 2, corn meal, molasses, and skim milk, 6:5:25; lot 3, corn meal, molasses, and garbage tankage, 4:2:9; lot 4, corn meal, garbage tankage, and skim milk, 4:9:18; lot 5, corn meal, molasses, garbage tankage, and skim milk, 4:2:9:18; and lot 6, corn meal, garbage tankage, and molasses, 4:8:3. It was necessary to neutralize the acid condition found in the garbage tankage by means of bicarbonate of soda or lime water. The average daily gains per head for the respective lots were 1.72 and 1.5, 1.37 and 1.57, 1.37 and 1.57, 1.1 and 2, 1.4 and 1.72, and 1.65 and 1.64 lbs.; the cost per pound of gain, 7.7, 7.5, 4.2, 5.7, 5.6, and 3.5 cts. The garbage tankage product analyzed as follows: Moisture, 61 per cent, protein, 8.13; carbohydrates, 25.06; and ash, 5.81. Rations for swine are suggested.

Swine-feeding experiments with heated and unheated skim milk and with dried yeast, KLEIN (*Milchw. Zentbl., 43 (1914), No. 14, pp. 381-384*).—In these experiments with 7-week-old pigs it was demonstrated that heated skim milk fed in addition to potato flakes and barley bran slightly increased the daily gains during a 12-week period over pigs fed unheated milk, while with pigs fed a similar ration, but in which a portion of the unheated milk was replaced by dried yeast, the daily gains were materially lower.

Fattening pigs on cassava, A. GOVIN and P. ANDOUARD (*Bul. Soc. Nat. Agr. France, 74 (1914), No. 4, pp. 481-483*).—It was demonstrated that in the case of pigs fed milk in addition to cassava it took only 3 lbs. of cassava to produce

a gain in live weight of 1 lb. On substituting for the milk ration 1.1 lbs. of rice gluten and 2½ oz. of bone meal, which are estimated to be the equivalent in nutrients of 1 gal. of separated milk, there was required to produce a gain of 1 lb. live weight only 2.9 lbs. of cassava. While in former experiments (E. S. R., 30, p. 174) the cassava had been fed to the pigs in slices, cooked and crushed, in these experiments it was fed raw, although chopped fine.

How southern farmers may get a start in pig raising (U. S. Dept. Agr., Office Sec. Spec. [Circ.], 1914, Nov. 25, pp. 4).—General suggestions are given.

Horse and mule raising in the South (U. S. Dept. Agr., Office Sec. Spec. [Circ.], 1914, Nov. 25, pp. 4).—General suggestions are given.

Poultry production, W. A. LIPPINCOTT (Philadelphia: Lea & Febiger, 1914, pp. VIII+17-476, pl. 1, figs. 205).—This deals with the breeding, feeding, care, and management of poultry, together with a chapter on preparing poultry products for consumption.

Suggestions on poultry raising for the southern farmer (U. S. Dept. Agr., Office Sec. Spec. [Circ.], 1914, Nov. 30, pp. 4).

Report of the poultry husbandman, H. R. LEWIS and A. L. CLARK (New Jersey Stat. Rpt. 1913, pp. 211-228, 234-259, 271-276, 279-290, pls. 18).—A test made in April to determine the efficiency of a 3,000-egg capacity incubator gave a percentage of hatch of fertile eggs of 77.4, and a percentage in July of 85. Comparing compartments run dry with those run wet it was observed that the latter gave a much higher percentage of hatch as well as an increase in the weight of the chicks, the average weight for the dry being 1.2 oz. and for the wet 1.25 oz.

Four brooders of 100 week-old chicks each were fed for nine weeks, two lots receiving a regular chick ration and the two other lots receiving in addition all the sour skim milk they would consume. The first two brooders made a total gain of 48.62 lbs. and 42.35 lbs., and the mortality was 71 and 73, respectively, while the last two brooders made a total gain of 82.22 and 81.94 lbs., and the mortality was 28 and 28, respectively. It was found to require 3.6 qt. of skim milk to produce a pound of body weight. It is stated that the skim milk-fed chicks represented a more uniform flock than those not so fed. It is thought that skim milk has the power to kill the organisms which cause many poultry diseases, the bacilli being destroyed by the dilute acid of the sour milk.

A brief discussion of the ash and protein factor in poultry feeding, previously reported from another source (E. S. R., 31, p. 568), is given.

The gasoline colony brooder, outdoor lamp-heated brooder, adaptable hovers, the underneath-pipe system, and the overhead-pipe system of brooders are described. It is thought that for the general farm flock the colony brooders or adjustable hovers are best, while for the egg farmer either of these two methods is suitable, or either of the pipe systems in a long house.

In trials with three lots of Leghorn pullets, hatched February 26, April 8, and June 10, respectively, the yearly egg production was 140, 180, and 95 eggs, the feed cost per bird \$1.32, \$1.64, and \$1.25, and the profit per bird above feed \$1.98, \$2.99, and \$1.53, respectively. It was found that soy beans would produce a continuous supply of succulent green feed from August 15 until November, and that owing to their luxuriant growth they produced a liberal amount of shade for the growing chickens. The soy-bean pods were not eaten by the birds, thus probably making it possible to reseed by disking and rolling. The value of mangels as a winter feed for poultry is discussed. The lower leaves of the mangels were slipped three times during the summer and furnished a large amount of green material.

One lot of hens fed for 12 months on a ration consisting of 25 per cent of meat gave an average yearly egg production per bird of 140 eggs, the feed per bird costing \$1.32, and the profit per bird above feed being \$1.98, while another lot fed a similar ration with 10 per cent meat scrap gave an average of 96.7 eggs per bird, costing \$1.27 for feed and yielding a profit of \$1.10 per bird.

It has been observed that a close relation exists between the degree of vigor present in the individuals at breeding time and the vigor of the offspring. Natural vigor may be decreased and increased in young stock by care, feeding, and management while it is growing. Layers and breeders, as well as male birds, are usually lacking in vigor during long periods of excessively hot weather and after periods of continuous heavy laying or intensive use in the breeding pen. Some of the characteristics by which the vigor and vitality of an individual may be judged are the color of the comb, the brightness of the eyes, the strength of the beak, the breadth of the back, the depth of the body, color of the shanks and skin, and the activity of the individual.

An account is given of a White Leghorn hen which yielded in her first year's production 246 eggs weighing 29.5 lbs. She consumed 118.5 lbs. of feed, or 92 lbs. of dry matter, costing \$1.79 and yielded a net profit of \$4.72. During the second year this hen laid 221 eggs weighing 21.6 lbs., or a total of 467 eggs in 730 days. It is said that this hen is one of 20 birds which are the product of definite breeding for high fecundity and whose average yearly production for the first season's laying is over 190 eggs.

The results attendant upon special mating indicate that it is through the male progeny primarily that the egg-producing propensities of any given female are transmitted.

In crossbreeding experiments the occurrence of barred chicks from a supposedly pure-bred White Leghorn male of known breeding is noted. These barred pullets show throughout the Leghorn carriage, and nearly all of the Leghorn characteristics are present with the exception of the plumage pattern.

With a view to determining the mode of inheritance of common variable factors in different breeds, namely, plumage pattern, color of ear lobe, shank, egg, beak, and feet, body shape and shank feathering, reciprocal crosses were made between standard-bred White Leghorns and Black Langshans. In the F_1 generation nothing but white birds were obtained, none of which, however, were pure white. No barred feathers were apparent, but black feathers were quite common. It appeared from an analysis of the F_1 generation that in "the case of shank and eye color, the factor of sex limitation was present; the female progeny inherits from the paternal parent only, while in the case of shank feathering the presence of this character is in each case dominant over its absence, no sex limitation being apparent."

A crossbreeding experiment with Muscovy ducks, which produce eggs requiring five weeks of incubation to hatch, with Pekin ducks, whose eggs hatch in four weeks, is reported. The eggs from the Pekin ducks and a Muscovy drake required about two days longer than the pure-bred Pekin ducks for hatching, while the eggs from Muscovy ducks and a Pekin drake were thought to require nearly the full five weeks. All of the 30 ducklings hatched from White Pekin females and a White Muscovy male were nearly black in color, resembling quite closely that of the colored Muscovys. The young hybrid ducks seemed to be equally as vigorous as the pure-bred ducks of either kind. They grew faster, however, than the young ducks of either pure variety.

"The crossbred ducklings presented much the same appearance as did the Muscovy ducklings, there being more meat in proportion to the total weight of

the carcass than on the Pekins. They both had a bright yellow skin and the breast was well covered with meat. The unevenness in size, which is always present with Muscovy ducks in respect to the sexes, was not so apparent with the hybrid ducklings. . . . As the hybrid ducks matured almost no difference was apparent between them as indicating one sex or another. The Pekins' characteristic sex features are the curled feathers upon the tail and the peculiar voice. The characteristic sex features of the Muscovys are principally those of size. With the hybrids no curled tail feathers appeared; in size all remained quite equal, and the voice seemed to be much like that of the Muscovys. Upon examination only two of the hybrid ducks could be found that were apparently males; these two in size and other outward appearances were almost identical with the rest. All of the rest but one seemed to have both male and female organs. One seemed to show genuine female characteristics, and the hermaphroditic characters were not present."

Records kept of nine breeds give for the White Leghorn breed a total percentage of the theoretical production for the year of 31.37, for the Rhode Island Red 29.36, for the Barred Plymouth Rock 27.06, for the Buff Orpington 25.17, Black Langshan 22.29, White Orpington 20.33, White Wyandottes 29.44 (eight months), White Plymouth Rock 22.96 (nine months), and the Light Brahma 12.72 (three months). The average percentage of the theoretical production by months was as follows: November, 1912, 5.65; December, 14.1; January, 1913, 20.28; February, 25.66; March, 41.61; April, 49.72; May, 48.63; June, 42.68; July, 42.69; August, 29.22; September, 18.49; and October, 9.

Tests were made to determine the efficiency of the parcel-post method of shipping eggs. It was found that the cost of shipping eggs was in all cases less than shipping by express, and proportionately much less in near-by than in long hauls. Of the shipments 20 per cent arrived in excellent condition, 40 per cent had some eggs cracked, and 40 per cent one or more completely broken. It seemed to be a question of care in handling rather than of kind of package. It is concluded that parcel post does not offer a reliable method of shipping eggs for hatching or for table purposes and that the violent shaking to which the eggs are subjected in some cases caused a rupture of the shell membrane and destroyed their hatching power.

Poultry rations and methods of feeding, H. R. LEWIS (*New Jersey Stas. Circ. 39, pp. 3-8; Rpt. 1913, pp. 228-233*).—A reprint of a portion of Bulletin 265, previously noted (E. S. R., 31, p. 568), in which rations for laying hens, chicks, and broilers are suggested.

The establishment of a new breed of chickens on the basis of Mendelism, A. HINK (*Deut. Tierärztl. Wchnschr., 22 (1914), No. 26, pp. 409, 410*).—Experiments are reported in which Wyandottes and an Italian breed were crossed for several generations, resulting in the formation of a breed having a partridge color, a small rose comb, a vigorous constitution, good laying qualities, and other desirable characteristics. From a study of the rose-comb characteristic it was evident that inheritance followed the ordinary Mendelian rule of inheritance.

On inheritance of weight in poultry, R. C. PUNNETT and P. G. BAILEY (*Jour. Genetics, 4 (1914), No. 1, pp. 23-39, pls. 2, figs. 9*).—The two breeds selected for these breeding experiments were the Gold-penciled Hamburg and the Silver Sebright Bantam, the object being to learn something about the transmission of weight in poultry. It is concluded that "the facts of breeding offer a clear indication that weight may depend upon the presence or absence of definite genetic factors segregating from one another in gametogenesis on lines with which students of these matters are already familiar." A scheme is sug-

gested by which the phenomena observed in these experiments may be interpreted in terms of genetic factors.

Size inheritance in rabbits, E. C. MACDOWELL (*Carnegie Inst. Washington Pub. 196 (1914), pp. 55, figs. 9*).—The author explains the theory and gives examples of multiple factors. In experimental work upon rabbits in which comparatively small and large races were crossed a study was made of skeletal measurements and of adult weight, from which observations it was concluded that "whether on the basis of the comparison of the ranges of litters of the first filial generation with those of their corresponding back crosses, or whether on the basis of the relative variability of the two generations as shown by the standard deviations of the coefficients of size, or by the distribution of frequencies in relation to the parents or grandparents, or, finally, by their body weights, there is found a consistently greater diversity of sizes in the back cross than in the first hybrid generation. Characters occur among the second generation that are smaller than the corresponding characters in the small parent; others that are above the modes of the first generation large parents."

The general law is stated as follows: "The second generation of a size cross shows greater diversity than does the first generation or the parental lines. Size characters that are inherited in a Mendelian fashion are included in the above statement."

An extensive bibliography is included, and a prefatory note and appendix by W. E. Castle.

Oyster propagation observations for 1913, J. NELSON (*New Jersey Stat. Rpt. 1913, pp. 489-534, pls. 6*).—These studies include the usual climatic data as to the amount of sunshine and rain, temperature, and winds, and observations on the temperature and saltness of the water, and the tidal ebb and flow, the progress of spawning by the oysters, the distribution and rate of growth of the embryo or larval oysters ("fry"), and the setting of the spat (E. S. R., 30, p. 374).

DAIRY FARMING—DAIRYING.

Report of dairy husbandman, A. S. COOK (*New Jersey Stat. Rpt. 1913, pp. 293-333, 355-365, pls. 3*).—Two lots of eight cows each, of practically uniform weight and production, were fed by the reversal system for two periods of 40 days each (10 days preliminary feeding intervening) on the following daily rations: Lot 1, an average of 3.42 lbs. of soy-bean meal; lot 2, 3.44 lbs. of cotton-seed meal, in addition to the regular basal ration of oats and pea hay, alfalfa hay, silage, green feed, beet pulp, and corn-and-cob meal, both lots receiving practically the same total amount of nutrients.

The production of milk was practically the same on each ration, there being a difference of only 275 lbs. in favor of cotton-seed meal in the entire period. The soy-bean ration produced 27.7 lbs. more of milk fat than the cotton-seed meal ration. The weights of cows during the experiment had the same uniformity as the milk produced, there being a difference of only 100 lbs. in favor of cotton-seed meal in the total weights of the two groups.

"The cost of milk was 2.2 cts. per quart on the cotton-seed meal ration and 2.3 cts. on the soy-bean meal ration. Results of this experiment indicate that when the price of cotton-seed meal is \$33 [per ton] the dairyman can afford to pay \$41 for soy-bean meal."

The average yearly milk yield for the 33 cows in the station herd was 8,547 lbs. per cow, the average milk fat yield 319.1 lbs; the average cost of roughage, figured at market price \$61.81, or when figured at the cost of production \$34.56; the average cost of grain \$51.54; the average profit with milk at 5 cts. per quart

\$91.80; the average returns per 100 lbs. expended for feed \$1.80; and the average cost of feed per quart of milk 2.8 cts.

Complete records are given of the feed consumed and cost of feed, together with the weight and average gain in weight per day for eight calves, for a period of six months. All of the calves were removed from the dam immediately after being dropped, and were fed whole milk during the first 30 or 40 days except two of the calves which were put on skim milk soon after birth. It was found that the average daily gain in weight was practically the same when the calves were fed skim milk as whole milk. The grain ration consisted largely of bran, gluten, and Ajax flakes. Grain was placed before each calf when they were about three weeks old and they were allowed to consume both grain and alfalfa at will.

It was found that when a small amount of oat meal and soaked beet pulp was added to the grain ration for the calves during the first few weeks they would consume more than when the straight grain mixture was fed. Another satisfactory mixture was found to be corn-and-cob meal, bran, and linseed meal, 8:4:1.

Data are given on the average daily rations, production, feed cost, and profit of cows of the various breeds as determined by records obtained in advanced registry work.

[Dairy husbandry], C. T. AMES (*Mississippi Sta. Bul. 165 (1914), pp. 23-26*).—At the Holly Springs substation the estimated cost of keeping a cow for 12 months was \$47.33, which included 150 days winter feeding at 15.5 cts. per day and 210 days of summer feeding at 4.8 cts. per day. It is stated that if the value of the manure is allowed to offset the cost of labor in running the dairy, each cow produced a net average of about \$65.16, which does not take into account the skim milk fed to pigs and calves nor the calves themselves.

Feeding the farm cow in the South (*U. S. Dept. Agr., Office Sec. Spec. [Circ.], 1914, Dec. 18, pp. 4*).—General suggestions are given.

Advantages of dairying in the South (*U. S. Dept. Agr., Office Sec. Spec. [Circ.], 1914, Dec. 18, pp. 4*).—A discussion of the advantages of dairying to the southern farmer.

Do you keep a cow? (*U. S. Dept. Agr., Office Sec. Spec. [Circ.], 1914, Dec. 16, pp. 4*).—General information on dairying, designed for the cotton-belt farmers.

Milk records and cost of feeding cows in Berkshire, 1913, J. MACKINTOSH (*Univ. Col. Reading, Dept. Agr. and Hort. Bul. 19 [1913], pp. 56*).—Data are given, collected from 12 farms in Berkshire, England, on the cost of winter and summer feeding of dairy cows. A great variation was found among the several farms, and it is concluded that a material lowering of the cost of production could be effected if farmers would keep milk records and feed records and act on the information thus obtained.

[Milk production] (*Mark Lane Express, 112 (1914), No. 4339, p. 589, fig. 1*).—In connection with investigations carried out on a number of farms in Yorkshire, England, it was found that though high yield and low fat content and low yield and high fat content do not invariably go together, yet in the case of cows yielding under 400 gal. of milk, the milk contained an average percentage of 3.92 of fat. The percentage decreased with an increased milk production, and the milk of cows yielding over 1,000 gal. contained only 3.48 per cent fat.

The importance of milking at regular intervals was shown by the fact that of the 18 samples containing less than 3 per cent fat in the morning milk, no fewer than 13 were contributed by a farm where the intervals were very unequal. It was observed that while the lengthening of the night interval tends to raise the yield of milk and lower the percentage of fat in the morning milk-

ing as compared with the evening milking, it has little effect on the total weight of fat given at each milking.

On the law relating milk flow to age in dairy cattle, R. PEARL (*Proc. Soc. Expt. Biol. and Med.*, 12 (1914), No. 1, pp. 18, 19).—The author finds that, contrary to the general assumption, the relation between the two variables milk flow and age is a strictly linear one. "The amount of milk produced by a cow in a given unit of time (7 days, 1 year, etc.) is a logarithmic function of the age of the cow." The law may be stated in the following way:

"Milk flow increases with increasing age but at a constantly diminishing rate (the increase in any given time being inversely proportional to the total amount of flow already attained) until a maximum flow is reached. After the age of maximum flow is passed the flow diminishes with advancing age and at an increasing rate. The rate of decrease after the maximum is, on the whole, much slower than the rate of increase preceding the maximum." In general the law applies to the absolute amount of fat produced in a given time as well as to the amount of milk.

General rules and regulations regarding the conduct of advanced registry tests in New Jersey, A. S. COOK (*New Jersey Stas. Circ.* 38, pp. 3-7).—This gives general directions to breeders and supervisors regarding the conduct of advanced registry tests in New Jersey.

The production and care of milk and cream (*U. S. Dept. Agr., Office Sec. Spec. [Circ.]*, 1914, Dec. 31, pp. 4).—A popular discussion.

Handling milk in pint bottles, E. KELLY (*Hoard's Dairyman*, 48 (1915), No. 25, p. 745).—In surveys made by the U. S. Department of Agriculture of the relative number of milk bottles handled by milk dealers in five cities, it was found that a surprisingly large number of pint bottles are used. With 74 dealers an average of 1.39 pints was handled for each quart, and these constituted 41 per cent of the entire bottled milk. It is believed that because of the small profit made in some cases on milk handled in pints, it would be well for dealers to encourage the quart trade in every possible way.

The pasteurization of milk in the final package, B. W. HAMMER and A. J. HAUSER (*Iowa Sta. Bul.* 154 (1914), pp. 321-356, figs. 6).—In the work reported an effort was made to determine the most favorable vat temperature and time of exposure for final package pasteurization. The points considered in the determination were bacterial efficiency, creaming ability, and the heated flavor produced.

It was found that "the method of final package pasteurization must be regarded as a modified holding method because of the slowness with which the bottled milk can be heated or cooled.

"High pasteurization temperatures are unsatisfactory for the method of final package pasteurization because of the decreased creaming ability and pronounced heated flavor of milk so treated.

"An exposure of 50 minutes in water at 145° F. gave an average bacterial efficiency of 99.56 (13 experiments) and an average creaming ability of 94.68 (20 experiments). The heated flavor developed was so slight that only 8 persons out of 61 detected that the milk had been pasteurized.

"Milk pasteurized in the bottles with an exposure of 50 minutes in water at 145° was very satisfactory from the viewpoint of the consumer. Out of a total of 61 persons, 11 preferred the raw milk, 36 preferred the pasteurized, and 14 saw no difference.

"The intensity of the heated flavor in milk depended to a certain extent on the amount of fat present, inasmuch as the larger quantities of fat tended to mask the heated flavor. Because of the influence of various factors, such as the fat content, and also on account of the variations in the ability of different persons

to detect a heated flavor, it is believed to be impossible to make a statement with reference to the exposure necessary to produce this flavor.

"An exposure of 50 minutes at 145° is satisfactory for half pints, pints, or quarts of milk. Exposures satisfactory for milk appear to be satisfactory for cream, if we can judge from the results obtained with pint bottles.

"The exposure of milk to air during the heating process had no detectable influence on either the creaming ability or the detection of a heated flavor.

"Milk pasteurized in bottles by an exposure of 50 minutes in water at a temperature of 145° underwent much the same type of fermentation as good raw milk although in the former case the appearance of the fermentation was, as would be expected, materially delayed.

"As the vat temperature is increased above 145° the results obtained are progressively less desirable. A vat temperature of 140° is objectionable mainly on account of the long exposure necessary.

"With short exposures at various vat temperatures an increased creaming ability of the milk so treated was frequently observed but, with exposures which would satisfy the requirements regarding bacterial efficiency, such an increase was not observed.

"Final package pasteurization did not decrease undesirable flavors in milk and in some cases seemed to intensify them.

"Cream with a slightly increased acidity is undesirable for final package pasteurization because of the appearance of the heated cream as well as because of the sensation it gives to the tongue.

"A flavor was imparted to the milk by the paper lining of the cap in some cases. This defect has apparently been recognized by the manufacturers and a cap with a parchment paper lining is at present being made."

Experiments on the pasteurizing of milk in bottles, WEIGMANN (*Mitt. Deut. Milchw. Ver.*, 31 (1914), July, pp. 149-165, figs. 3).—Successful experiments are reported on pasteurizing milk in bottles at from 64 to 66° C. (147.2 to 150.8° F.) for $\frac{1}{2}$ hour. The bacteria content was materially decreased and the keeping quality greatly increased. A variety of forms of bacteria were found in raw material but in the pasteurized product only lactic acid bacteria, isolated *Bacillus mesentericus*, and some few resistant forms were found. The apparatus and method of pasteurizing is described.

Testing and handling dairy products, C. LARSEN and J. M. FULLER (*South Dakota Sta. Bul.* 152 (1914), pp. 28-56, figs. 8).—Items discussed in this bulletin are methods of testing milk and cream for milk fat, testing cream for acidity, care of the separator, causes of variation in the cream test, and methods of producing high quality cream.

Preserving milk samples for examination, J. TILLMANS, A. SPLITTGERBER, and H. RIFFART (*Ztschr. Untersuch. Nahr. u. Genussmit.*, 27 (1914), No. 12, pp. 893-901).—In tests with various preservatives of milk it was found that thymol, phenol, creosote, and sodium fluorid cause the milk to coagulate after 24 to 48 hours. Bichromate of potash, owing to the intense yellow color it gives to milk, does not allow an accurate determination of the degree of acidity to be carried out. Chloroform causes an increase of refraction and of fat content, and creosote a decrease of specific gravity. Thymol and creosote weaken the diphenylamin reaction to a considerable extent, as is also the case with oil of mustard and phenol. Bichromate of potash causes the milk to give a strong positive reaction with diphenylamin, even without the addition of a nitrate.

Corrosive sublimate appears to be the most satisfactory of any of the preservatives tried. When used in a 0.04 to 0.03 per cent solution it preserves milk quite fresh for 120 hours without any noticeable increase in acidity. It has no action whatever upon the milk constants and allows the quantitative deter-

mination of nitrates to be carried out even after 120 hours. It is advised that Congo red at the rate of 0.2 cc. of 2 per cent solution be added to the sublimate for every 250 cc. of milk. It has no effect upon the analysis of the milk and is a warning of the poisonous character of the preservative.

Water content of butter, W. THEOPOLD (*Ber. Nahrmtl. Untersuch. Amt. Bromberg.*, 1913, p. 16; *abs. in Ztschr. Untersuch. Nahr. u. Genussmtl.*, 28 (1914), No. 2, pp. 109, 110; *Jour. Soc. Chem. Indus.*, 33 (1914), No. 22, p. 1106).—Tests indicate that butter does not increase in weight by absorption of water when moistened externally or placed in cold water for 70 hours. A sample of butter containing 22.9 per cent water showed 22.6 per cent after treatment, while another sample with 18.8 per cent showed 18.2 per cent.

Marketing butter and cream in the South (*U. S. Dept. Agr., Office Sec. Spec. [Circ.]*, 1914, Dec. 19, pp. 3).—A brief discussion of methods.

Making farm butter in the South (*U. S. Dept. Agr., Office Sec. Spec. [Circ.]*, 1914, Dec. 28, pp. 4).—General suggestions are given.

Shall southern farmers build creameries? (*U. S. Dept. Agr., Office Sec. Spec. [Circ.]*, 1914, Dec. 28, pp. 3).—A brief discussion on organizing and conducting a farmers' creamery.

Dairy bacteriology, A. WOLFF (*Molkereibakteriologische Betriebskontrolle. Berlin: P. Parey*, 1914, pp. VI+118, figs. 9).—This is a general text treating of the bacteriology of milk and its products, giving directions on methods of preparing cultures and identifying the various bacteria, and methods for the market control of dairy products.

Bacilli coli of milk, B. A. VAN KETEL (*11. Cong. Internat. Pharm. [The Hague]*, 1913, Raps. 5. Sect., pp. 109-111).—It is stated that the usual source of contamination is the feces, the body of the cow, or the feed, and that the optimum temperature for growth is 37.5° C. (99.5° F.). There appeared to be a variety of opinions on the temperature required to destroy bacilli coli, ranging from 62 to 75°, and depending upon the duration of the period.

Analyses of the milk of sick cows, B. SJOLLEMA (*11. Cong. Internat. Pharm. [The Hague]*, 1913, Raps. 5. Sect., pp. 83-86).—It is stated that in general the milk of sick cows shows a greater degree of acidity and contains an increased quantity of the ferments catalase, reductase, and amylase. The lactose content is diminished, while the chlorin and albuminoids show an increase. In extreme cases the milk shows an abnormal color.

A study of streptococci isolated from certain presumably milk-borne epidemics of tonsillitis occurring in Massachusetts in 1913 and 1914, T. SMITH and J. H. BROWN (*Jour. Med. Research*, 31 (1915), No. 3, pp. 455-502).—After their extensive studies the authors conclude that the "streptococci causing epidemics of tonsillitis are not necessarily the same in different epidemics either in the same or different localities. . . . There is at present no satisfactory evidence that bovine streptococci associated with mastitis or garget are the agents of tonsillitis in man. Whenever cases of garget are suspected as sources of infection in man, both human and bovine types should be looked for."

Reindeer milk production, G. GROTENFELT (*Mælkeritid.*, 27 (1914), No. 22, pp. 399-411, figs. 24).—Analyses are given of reindeer milk, and methods of making reindeer cheese are described.

VETERINARY MEDICINE.

Annual reports of the official veterinarians of Prussia for 1910 and 1911, NEVERMANN (*Veröffentl. Jahres-Vet. Ber. Tierärzte Preuss.*, 11 (1910 [pub. 1912]), pt. 1, pp. VI+136, pls. 17, figs. 2; 11 (1910 [pub. 1913]), pt. 2, pp. IV+171; 12 (1911 [pub. 1913]), pts. 1, pp. VI+137, pls. 16; 2, pp. IV+131).—

These, the eleventh and twelfth annual reports (E. S. R., 27, p. 181), deal with the occurrence, etc., of animal diseases in Prussia. Much statistical data is presented in tabular form.

Veterinary calendar for the year 1915, edited by M. RAUTENBERG (*Veterinär-Kalender für das Jahr 1915*. Berlin: August Hirschwald, 1914, 1. Abt., pp. XVI+308; 2. Abt., pp. VIII+585, figs. 65).—The forty-ninth annual edition of this publication. Part 1 includes directions for treating the more important diseases as prescribed in the Veterinary High School at Berlin; symptoms and therapy of poisoning, with chemical methods for detecting poisons; excerpts from materia medica; data on slaughter animals and meat inspection; the judgment of meat; veterinary jurisprudence; fees for veterinarians doing court work; and various tables (gestation, temperature, etc.) pertaining to veterinary matters.

Part 2 gives a list of the civil and military veterinary officials, and contains chapters on serodiagnosis, the microscopic examination of bacteria on cover glass preparations, the technique and significance of the urine examination, examination of feeds, and much data relating to the administration of laws germane to veterinary and public health practice. The fees set down by law for professional services are also included.

International catalogue of scientific literature. R—Bacteriology. QR—Serum physiology (*Internat. Cat. Sci. Lit.*, 10 (1914), pp. VIII+602+182+23).—This deals with some of the literature of bacteriology and serology. Topics coming under the latter heading are now grouped in a separate chapter entitled Serum Physiology. The American literature is not treated adequately.

Animal castration, G. R. WHITE (*Nashville, Tenn.: Author*, 1914, pp. 241, figs. 209).—A well-illustrated work dealing with the subject as it relates to the equine, bovine, porcine, ovine, canine, feline, and fowl. The deodorization of the skunk is also considered.

Special veterinary therapy, M. R. STEFFEN (*Chicago: Amer. Jour. Vet. Med.*, 1914, pp. 97).—A collection of therapeutic notes based upon more than ten years' active practice by the author.

The use of drugs in the treatment of disease caused by nematode worms, J. F. CRAIG (*Amer. Vet. Rev.*, 46 (1915), No. 5, pp. 490-509).—A somewhat detailed discussion of this subject, which was presented at the Tenth International Veterinary Congress held at London in 1914.

Animal immunity, W. ROSENTHAL (*Tierische Immunität*. Brunswick: F. Vieweg & Son, 1914, pp. X+329, fig. 1).—This work is intended for the non-technical man, the student of medicine, and the physician not yet versed in the science of immunity.

The vitamins, C. FUNK (*Die Vitamine*. Wiesbaden: J. F. Bergmann, 1914, pp. VIII+193, pls. 2, figs. 38).—This deals with the significance which the vitamins have for physiology and pathology, with special reference to the avitaminoses (beri-beri, scorbutus, pellagra, and rickets). An appendix is included which deals with the growth substances and the cancer problem.

A chapter bearing on the possible relation of the vitamins to "stijfziekte" and "lamziekte" (Theiler) in horses is also included. Discussing the subject the author points out that investigations are necessary to prove this relation.

Experimental study of the Abderhalden test, A. H. BUNCE (*Abs. in Jour. Amer. Med. Assoc.*, 62 (1914), No. 19, p. 1499).—Out of 34 tests for pregnancy 16 were positive and 17 negative. In no case was a negative reaction obtained in a proved pregnancy. In the preliminary work contradictory results were obtained, but this was due to faulty technique, such as taking serum from patients soon after meals, when the blood was charged with much amino acid.

The method may also serve as a valuable aid for substantiating and strengthening clinical results in doubtful cases.

About a new skin reaction for diagnosing pregnancy, E. ENGELHORN and H. WINTZ (*München. Med. Wchnschr.*, 61 (1914), No. 13, pp. 689, 690, fig. 1; *abs. in Jour. Amer. Med. Assoc.*, 62 (1914), No. 19, p. 1514).—The reaction is conducted in a manner similar to the tuberculin and luetin reactions, viz, by injecting the alien protein into the skin. In the test an extract of the placenta, termed "placentin," was used.

"In 70 pregnant women a reaction in the skin was constantly obtained, while there was no reaction in 53 men and children and nonpregnant women. The only contradictory finding was a positive reaction in one child of six with bladder disease. The reaction became positive in pregnant women from the seventh week on and persisted for three or four days after delivery."

On the filterability and biology of spirochetes, S. B. WOLBACH (*Amer. Jour. Trop. Diseases and Prev. Med.*, 2 (1915), No. 8, pp. 494-505, pls. 2).—The author's conclusions are "that the method of filtration as a means of separating spiral organisms from ordinary bacteria will probably hold good for other saprophytic and pathogenic spirochetes and allied micro-organisms; that organisms larger than many bacteria will pass the Berkefeld V, N, and W filters, namely, *Spirochæta duttoni*, and the ones we have tentatively called *S. elusa*, *S. biflexa*, and the spiral organism from the colon of man, which is probably the organism commonly recognized in preparation as an 'intestinal spirochete'; that there is no evidence of spirochetes multiplying by any other method than single fission. It is certain that the granules, coiled forms, and swollen terminals of the spiral organisms cultivated by us are not capable of multiplication in any form."

A simple method for the preparation of stable control extracts for anthrax precipitation, B. SCHUBERT (*Berlin. Tierärztl. Wchnschr.*, 30 (1914), No. 9, pp. 151, 152).—In the directions given for conducting the Ascoli procedure the making of two control tests is recommended for the purpose of excluding the possibility of errors, but the precipitation each time of a control extract is not convenient. By preparing $\frac{1}{2}$ cc. of the extract in the regular manner, filtering through asbestos into test tubes, and sterilizing for ten minutes for three successive days, a stable extract which may be used at any time is obtained. If a precipitation occurs after the first sterilization, the solution in the tubes is filtered through asbestos again in the manner described.

Nerve degeneration in fowls fed on unhusked rice (palay), R. B. GIBSON and I. CONCEPCION (*Philippine Jour. Sci., Sect. B*, 9 (1914), No. 1, pp. 119-123, pl. 1).—From this work it appears that the substitution of rough rice for the polished article is not completely protective against beri-beri in all individuals. The authors state that "we do not mean to say that this substitution has not practically eliminated beri-beri where it has been undertaken or that the use of rice polishing is not without great therapeutic value. But in view of the accumulated evidence, we can say that the addition of other feedstuffs to a diet of unpolished rice is essential to meet the normal nutritive requirements of the body."

[Foot-and-mouth disease] (*Cornell Vet.*, 4 (1915), No. 5, pp. 221-259, pls. 8, figs. 3).—A number of articles are here presented which relate to foot-and-mouth disease, namely, The Outbreak of Foot-and-Mouth Disease, by P. A. Fish (pp. 221-223); History of Foot-and-Mouth Disease, by J. Law (pp. 224-230); The Nature of Foot-and-Mouth Disease (pp. 231-234), Economic Significance and Methods for Control (pp. 247-250), and What Animal Owners Should Do to Prevent Foot-and-Mouth Disease (pp. 256-258), by V. A. Moore; Etiology and Morbid Anatomy, by C. P. Fitch (pp. 235-239); Symptomatology, by R. R. Birch (pp. 240, 241); Diagnosis and Differential Diagnosis, by D. H. Udall

(pp. 242-246); and Foot-and-Mouth Disease in New York State, 1914, by J. G. Wills (pp. 251-255).

The foot-and-mouth disease, what it is, what it does, how to fight it, and how to prevent it (*Garden City, N. Y.: Doubleday, Page & Co., 1914, pp. 19, figs. 6*).—This pamphlet embraces several articles, namely, Every Farmer's Duty in the Present Foot-and-Mouth Crisis, by V. A. Moore (pp. 3-7); Foot-and-Mouth Disease, Its Nature, Symptoms, Effects, and Treatment (pp. 8-16); and Historical Notes and Data Concerning the Disease in This Country and Abroad (pp. 17-19).

Foot-and-mouth disease [in the United States] (*Amer. Vet. Rev., 46 (1915), No. 4, pp. 380-397*).—This is a discussion of the outbreaks of foot-and-mouth disease that have occurred in this country.

About the utilization of the conglutination reaction as a diagnostic test for glanders, C. W. ANDERSEN (*Centbl. Bakt. [etc.], 1. Abt., Orig., 72 (1913), No. 4-5, pp. 394-398; abs. in Berlin. Tierärztl. Wchnschr., 30 (1914), No. 7, p. 124*).—The conglutination reaction (E. S. R., 28, p. 478) was studied with the sera from 225 horses. Parallel tests were run with the complement fixation method.

Fourteen of the sera reacted positively, and in 13 of the horses on section glanderous lesions were noted. In the fourteenth horse some old nodules were found in the lung. The complement fixation and the mallein tests showed positive in the latter case. Four sera gave partial fixation in the complement binding test but negative findings with the conglutination test. The four horses were found sound on autopsy. Two hundred and one sera gave negative complement fixation and conglutination reactions. The author believes the conglutination test is more sensitive and specific for diagnosing glanders than the complement fixation test. This work supports the findings of Stranigg.

The ophthalmic test in the diagnosis of glanders, F. FAVERO (*Mod. Zoiatro, Parte Sci., 25 (1914), No. 2, pp. 49-63; abs. in Jour. Compar. Path. and Ther., 27 (1914), No. 3, pp. 267-269*).—"The ophthalmic test does not always clearly indicate the existence of glanders. A positive ophthalmic test is specific. It is essentially a muco-purulent secretion which persists for at least 24 hours. In doubtful cases the ophthalmic test repeated at a short interval gives confirmatory results. In a positive reaction there is a high percentage of neutrophile polynuclear leucocytes in the conjunctival exudate, but this character is not specific."

An ophthalmic mallein eye dropper, W. WILSON (*Amer. Vet. Rev., 46 (1914), No. 1, p. 62, figs. 3*).—The apparatus consists of an ordinary medicine dropper with the point drawn out and bent at right angles. The tip of the dropper is fitted into a notch made in a camel's-hair brush just next to the hair, and the dropper is fastened by means of a clamp made from a thin piece of sheet copper. "By filling the dropper with mallein, which easily holds 10 to 20 doses, it may be squeezed out into the brush and placed into the eye, and any remaining in the dropper after the testing is completed may be returned to the bottle without being badly contaminated."

Simultaneous method of inoculating cattle and carabaos with serum from animals that have been recently immunized, A. R. WARD and F. W. WOOD (*Philippine Jour. Sci., Sect. B, 9 (1914), No. 1, pp. 125-135, pls. 3*).—Experiences with the simultaneous inoculation method utilizing blood drawn in the field have demonstrated "that there is no necessity for maintaining an expensive permanent laboratory and herd for the production of antirinderpest serum from hyperimmunized animals. A radical reduction in the cost of serum production has been effected, and in consequence the possibility of extensive employment of simultaneous inoculation in combating rinderpest has been demonstrated."

A note on surra in camels, H. E. CROSS (*Lahore, India: Govt., 1914, pp. 8*).—A brief account with directions for the diagnosis of the disease through a study of the blood, symptoms, and post-mortem appearances; the treatment, etc.

Wholesale handling of bovine tuberculosis in Colorado, W. W. YARD (*Amer. Vet. Rev., 46 (1914), No. 1, pp. 56-59*).—A statement about the occurrence of tuberculosis amongst bovines and pigs on a farm owned by one of the richest men in Colorado, and illustrating some of the difficulties which may be encountered by an official veterinarian in eradicating tuberculosis from a herd in which the support of the owner is not given. Stock worth \$75,000 was destroyed.

The diseases of the internal generative organs in relation to dairy inspection, W. L. WILLIAMS (*Rpt. N. Y. State Vet. Col., 1912-13, pp. 193-200*).—This is a general discussion of the diseases of the internal generative organs that are of importance in dairy inspection.

A study of infectious abortion in cattle, V. A. MOORE and C. P. FITCH (*Rpt. N. Y. State Vet. Col., 1912-13, pp. 82-114*).—This article discusses the cause, channels of infection, experimental infection, elimination of the causative organism, diagnosis, treatment, immunity, and control. A more recent report on this disease by Williams has been noted (*E. S. R., 31, p. 779*).

A bibliography of 67 titles is appended.

Experiments on the control of warble flies in Germany, SCHÖTTLER and GLÄSER (*Mitt. Ausschusses Bekämpf. Dasselplage, No. 6 (1914), pp. 1-31; abs. in Internat. Inst. Agr. [Rome], Mo. Bul. Agr. Intel. and Plant Diseases, 5 (1914), No. 9, pp. 1189, 1190*).—This report of the work of the Warble Control Committee carried on during 1913 in the district of Neuhaus on the Oste is in continuation of that previously noted (*E. S. R., 32, p. 60*). Of the 3,892 head of cattle treated, 75.4 per cent were freed from warbles, an average of 16.2 larvæ per head being removed.

In a second part of the paper a campaign against warbles in a district in the grand duchy of Oldenburg is reported upon. An experiment in which ten steers were kept under exactly the same conditions, five being freed from warbles and the others not, indicated that the loss in flesh caused by warbles amounts to more than the loss caused through damage to the hides.

The effect of the cattle tick upon the milk production of dairy cows, T. E. WOODWARD, W. F. TURNER, and C. CURTICE (*U. S. Dept. Agr. Bul. 147 (1915), pp. 22, figs. 6*).—This bulletin reports upon an experiment undertaken with a view to definitely determining the direct effect of the cattle tick (*Margaropus annulatus*) on the milk production and body weight of dairy cows.

In conducting the experiment, twenty grade Jersey cows of average dairy quality and in fair condition of flesh, all being immune to ordinary attacks of tick fever, were selected in the early part of their lactation periods. They were divided into two groups of ten animals each, one being freed from ticks and kept free, the other being kept tick-infested by applying seed ticks at regular intervals. The experiment began May 21, 1913, and lasted during a period of 140 days. The milk of each cow was weighed and a sample taken at every milking for a composite fat test at the end of each ten-day period. The body weights were taken for ten consecutive days at the beginning of the work; thence once every ten days until the last period, when they were taken for ten consecutive days as at the beginning of the work.

The investigations show that the cattle tick has a decidedly injurious effect upon supposedly immune dairy cattle, the extent of the injury being largely dependent upon the degree of infestation. The effect is more pronounced upon the milk production than upon the body weights when a sufficient supply of food is given.

"At the beginning of the test the tick-free and tick-infested groups gave practically the same amounts of milk; at the close the tick-infested gave only 65.8 per cent as much as the tick-free. The tick-free group gained 6.1 per cent in body weight; the tick-infested 3.6 per cent.

"Spraying or dipping tick-free cattle in an arsenical solution causes a marked though temporary decrease in milk flow. In this experiment there was an average reduction of 6.1 per cent from the normal milk flow for a period of five days following each of the four applications of the arsenical solution.

"Resistance of cattle to infestation by the tick is a variable quality. Of the ten animals in the tick-infested group, four became grossly infested; two more so than the average, and the remaining four but lightly infested.

"The death of cow 15, due to excessive tick infestation, and various recurrences of fever in the other animals, emphasizes the extreme hazard of cattle being continuously subjected to these losses by the tick. Cow 15 was one of the best of the tick-infested group and represented at least a 10 per cent loss from the capital invested in tick-infested cows. Furthermore, the losses observed in this experiment were sustained on rations sufficient to maintain body weights. It is thought that had there been but a scant supply of food, as sometimes occurs when cows are on pasture, the tick-infested cattle would have suffered earlier and probably to a greater degree than they did. The losses in this case were in spite of a good maintenance ration. It is probable that much of the spring losses in cattle now laid to starvation, due to lack of pasturage, is materially aided by blood depletion due to ticks, and that repeated dippings would save many cattle otherwise lost.

"These experiments are not extensive enough to furnish an exact measure of the amount of decrease in milk flow due to infestation, but they show that the losses are considerable and vary in immune cows largely in proportion to the extent of infestation, since in all cases the milk flow decreased faster in the heavily infested than in the lightly infested cows. This is additional evidence that the tick is a great hindrance to profitable dairying in the South. Even in so-called immune cattle, ticks cause irritation of the skin and withdraw blood that otherwise would produce milk or meat."

The dairy records of the experimental cows are given in tabular form in an appendix.

Investigations in regard to the action of immune sera against calf dysentery (scours) in infections with the bacteria of the coli and aerogenes group, O. STENSTRÖM (*Svensk Vet. Tidskr.*, 18 (1913), No. 3, pp. 73-83; *abs. in Centbl. Bakt. [etc.]*, 1. Abt., Ref., 59 (1913), No. 7, p. 216).—This is a study of the C. O. Jensen anticoli serum. The serum was able to fix complement. When saturated with antigen and then centrifuged for the purpose of removing the antigen the immunizing powers of the serum for guinea pigs were only slightly reduced. Bacteria killed with toluol and suspended in sterile distilled water were fatal for guinea pigs (endotoxic action). The toxic action was prevented by immune serum but not according to the law of multiples. The serum therefore apparently contains antitoxins, but its action is not entirely antitoxic. Leucocytes from exudates also acted antitoxic. In dilute solutions the serum predisposes toward phagocytic action. Antiaggressins were detected in the animal experiments, and the chief value of the serum is dependent upon the presence of these substances.

Studies on the hematology of normal and cholera infected hogs, R. R. DINWIDDIE (*Arkansas Sta. Bul.* 120 (1914), pp. 21-41, figs. 8).—In the course of a somewhat prolonged study of the blood of normal pigs and that of pigs

infected with hog cholera some peculiarities in the red blood corpuscles were observed.

When red blood corpuscles were studied in a fresh (unfixed and unstained) state they were found to throw out, from their margins, processes from the cytoplasm as active bodies of various bizarre forms which, in part, form the plasma granules seen by dark ground illumination. A more common feature of pigs' blood, and one which distinguishes it from any other animal species, is the occurrence within the area of the red cell of refringent motile bodies, which, with the highest of magnifications, show a certain degree of uniformity in shape and are apparently intracellular. They usually lie near the margin of the cell, but in their migrations they may alternately be above or below the focus, but never beyond the margin of the cell. Although first observed in normal pigs, they were noted in much increased quantities in the blood of hogs affected with cholera. The motility is inhibited by cold but goes on at ordinary room temperature, i. e., 70° or upward. "The motility of these endoglobular bodies is not to be compared with that of bacteria, nor can it be properly described as ameboid, nor yet as molecular."

"Omitting the smallest bodies too minute to allow recognition of their shape these bodies occur in three distinct forms: (1) As round or short oval slightly biconcave flattened disks; (2) as long oval or rice grain-like bodies; (3) as crescentic or horseshoe-like forms. All of these forms may be found in the same blood sample. Usually the disk form is most abundant. It also exhibits the most active motility and the greatest diversity in size." The crescentic or horseshoe shaped forms are the most sluggish in motion.

"The erythrocytes in which these bodies occur may be of normal size or slightly larger or smaller than the average and are not commonly otherwise distorted. Most frequently they occur singly in the cell, but doubles are nearly as common and six or eight may be found. Those cells which carry such numbers are generally smaller than the average, and I have only found them in cholera-infected blood." The cells in which these motile bodies are present are not obviously deficient in hemoglobin.

"Between the cells in pigs' blood and more numerous in infected blood, a variety of minute quivering or dancing bodies may be seen, the origin and nature of which I do not know." These may be offshoots of erythrocytes and are increased some hours after collecting the blood.

"In diseased blood (cholera infected) the intercellular or plasma granules are usually more numerous than in normal blood. In all pigs' blood they are greatly more numerous than in the blood of man." Spirochetes as observed by King (E. S. R., 30, p. 383) were not found.

In stained specimens of pigs' blood small round solidly stained bodies were seen within the erythrocytes. Only one of these coccoid bodies is usually present and it is eccentrically placed in the blood cell. "With methylene blue or Jenner's stain they are colored blue, with Giemsa, a dark ruby red. As to the erythrocytes, in which they occur, they are, with the exception to be noted, not otherwise abnormal. In the blood of some infected animals in which marked anisocytosis was present with diminished red cell count, most of these bodies would be found within enlarged cells (megalocytes) with deficient hemoglobin. In the same preparation, however, bodies would be seen within microcytes or cells of normal size. Unusual numbers of these bodies in any specimen were found quite generally associated with such abnormalities in the erythrocytes. Erythroblasts may be found in preparations from the blood of normal or noninfected pigs. They are often more abundant in the blood of cholera-infected animals, especially at a late stage of a chronic form of the

disease, but are never sufficiently abundant to form a feature of cholera infection."

Although intracellular bodies are increased as a rule quite markedly by an infection, this is not invariably the case. They are in some way connected, according to the author, or associated at least with conditions which give rise to malnutrition and anemia, and when a marked increase in number takes place, there is a corresponding decrease in the number of red cells.

The blood of three suckling pigs, four or five weeks old and farrowed by a mother which had been immunized for antiserum production, showed anemia, especially the fattest of the three, although all of the animals were apparently healthy in appearance. In all three the intracorpuseular bodies were unusually abundant. The bodies in pigs' blood are regarded as identical with the Jolly bodies of other workers and bear a close relation to the figures of Theiler's anaplasma, the reputed cause of gall sickness of South African cattle. Attempts to transfer these bodies to the guinea pig were unsuccessful.

In a small percentage of cases of acute hog cholera blood films treated with Giemsa or Wright stain showed the presence of ring-shaped forms. These had the appearance of being plastered over the surface of the red cells, some projecting beyond the margins, and even lying intercellular. "The rings are colored by the nuclear staining component of the stain various shades of purple to red. As already said, these ring forms are apparently absent or so rare as to escape observation in most samples of cholera blood, but in some cases they are exceedingly numerous. They appear in all preparations made from the same blood sample and are absent from others similarly treated for comparison, hence are attributable to the condition of the blood and not to defect in staining." Although these forms have never been noted in the blood of noninfected animals, they have not been sufficiently studied to allow of the suggestion that they are characteristic of cholera. They bear no resemblance to bacteria in either staining, properties, or shape. According to the author's present opinion they are foreign organisms of some kind, if not bacterial probably protozoal.

"Hog-cholera infection gives rise at an early stage to a pronounced leucopenia, with the appearance of numerous atypical mononuclear or transitional leucocytes. When inflammatory complications occur a polymorph leucocytosis appears. The destruction of red corpuscles is not a prominent feature of the disease."

[Hog cholera in New Jersey], F. C. MINKLER (*New Jersey Stas. Circ.* 40 (1914), pp. 21-29; *Rpt.* 1913, pp. 199-207).—The author describes the nature of hog cholera and preventive and remedial measures. A number of outbreaks were encountered in the State during 1913.

Atlas of equine anatomy, R. SCHMALTZ (*Atlas de Anatomie des Pferdes. Berlin: Richard Schoetz, 1914, pt. 3, pp. 20, pls. 14*).—This third part of the work previously noted (*E. S. R.*, 24, p. 485) deals with the position of the viscera as based upon studies of frozen subjects. Colored illustrations of twelve cross sections made of the trunk show the organs in situ.

The common colics of the horse, their causes, symptoms, diagnosis, and treatment, H. C. REEKS (*Chicago: Alexander Eger, 1914, 3. ed., pp. XVI+369, figs. 32*).—An enlarged edition of the work previously noted (*E. S. R.*, 14, p. 922).

Dourine in Nebraska, L. C. KIGIN (*Amer. Vet. Rev.*, 46 (1915), No. 5, pp. 563, 564).—This article records the discovery of the occurrence of dourine in Nebraska during the fall of 1914. It is thought to have entered the State in a shipment of horses from Wyoming.

[Poultry diseases], H. R. LEWIS and A. L. CLARK (*New Jersey Stas. Rpt.* 1913, pp. 276-279).—The authors report upon an outbreak of vent gleet among

recently purchased Buff Orpingtons at the poultry plant on the college farm, as a result of which the average egg production for the year was but 25 per cent of the theoretical. The percentage of fertility of the eggs was low, about 60, although apparently good vigorous male birds were used. The disease was found to be very hard to overcome and it is concluded that in dealing with it the best method lies in the destruction of the affected fowls.

In an attack of roup that broke out at the plant in January about the only birds affected were those in the pens laying the heaviest. Control measures consisted in the isolation of affected fowls as soon as detected. Most of the affected birds were treated and recovery resulted in a week or ten days.

The necessity of meat inspection of poultry, with especial regard to tuberculosis, A. BREUER (*Hússzemle*, 8 (1913), No. 11, pp. 81-83; *abs. in Berlin. Tierärztl. Wchnschr.*, 30 (1914), No. 12, p. 206).—The importance of examining the viscera of poultry, in addition to other parts, is pointed out. Where this is not done great danger exists of spreading the disease. At the Budapest abattoir 8,337 head of poultry shipped from Servia were examined, and of this number 188 were tubercular, of which 183 were diseased only in a few organs, especially in the digestive tract. In the Budapest market tuberculosis in fowls is said to be present to the extent of from 6 to 13 per cent.

RURAL ENGINEERING.

Wood pipe for conveying water for irrigation, S. O. JAYNE (*U. S. Dept. Agr. Bul.* 155 (1914), pp. 40, pls. 4, figs. 7).—This bulletin deals with the design, construction, durability, possibilities, and limitations of continuous and machine-banded wood pipe for several classes of service and is intended to be of interest to irrigation engineers, owners of irrigation works, water power companies, and water departments of municipalities. The studies reported included the inspection of many pipe lines throughout several western States, interviews and correspondence with manufacturers, builders, and operators of wood pipe, and a review of published data on the subject.

As regards the durability of wood pipe, data are presented to show that the length of time any pipe will last can not be accurately predicted without a thorough knowledge of all the conditions involved. "With pipes buried in the ground the wood will endure longest where the air is most nearly excluded either by a high internal pressure which completely saturates it or by a deep covering of very fine soil. . . . In contact with the soil wood pipe decays more rapidly under a light head than it does under heavy pressure, and other things being equal, it usually decays more rapidly in a porous open soil, such as sand or gravel, than it does in a fine soil of silt or clay, because the finer soil is more effective in excluding the air. Experience appears to indicate also that wood decays more rapidly in a loamy soil, rich in humus or partially decayed organic matter, than it does in one containing little or none. . . .

"The life of exposed pipes may be prolonged by promptly stopping all leaks as they develop and by keeping the exterior dry. The decay of buried pipes has also in some instances been arrested by removing the covering and leaving them exposed. . . . Where pipes are to be placed in contact with the soil, and where the internal pressure is not sufficient to insure complete saturation of the staves, it is probable that their durability may be increased by treating with some preservative. . . .

"Contrary to the theories commonly held thirty years ago, it has been found that the durability of wood pipe is usually dependent on the life of the wood rather than on the life of the bands. . . . Corrosion of the bands . . . usually occurs most rapidly where pipes are buried and the backfill is wet, under con-

ditions which, as a rule, are most favorable for the life of the wood. Corrosion is greatly accelerated by the presence of alkali in the soil. . . . Under such conditions the bands almost invariably fail at the bottom of the pipe. . . .

"With so many influences affecting the life of wood pipe no attempt should be made to strike an average of durability except in cases where attending conditions are known to be the same. Where pipes are fully exposed and supported free from all contact with the soil the conditions are much less variable than otherwise, and a life of at least twenty years may be quite reasonably expected for either fir or redwood if properly maintained. If placed in the ground or in contact with the soil, the life of wood pipe may, under very favorable conditions, be much greater than twenty years, otherwise it may be a great deal less. In contact with soil the durability is nearly always a matter of some uncertainty."

Irrigation investigations, G. E. P. SMITH and A. L. ENGER (*Arizona Sta. Rpt.*, 1913, pp. 280-285).—Further experiments with reinforced concrete caisson curbs (E. S. R., 29, p. 484) demonstrated their effectiveness for developing shallow wells.

Measurements of the surface flow of Sabino Canyon in the vicinity of Tucson from 1904 to 1912 indicate that the available supply is sufficiently large, but that "the remarkable disparity between the discharges of such years as 1904 and 1910 and those of 1905 and 1907, together with the fact that there is a tendency for several lean years to come together, necessitates much greater storage capacity for a reservoir project than would be the case if the rainfall, and hence the run-off, were more evenly distributed."

Experiments as to the necessary slope of the land in border irrigation indicated that "under ordinary conditions it is best to run the borders down the steepest slope, or nearly so, and thus reduce the cost of grading the land to a minimum, and then to adjust the width and length of the lands to the head of water. The effects of silts in river irrigating waters must be considered, inasmuch as these silts tend to settle out at the head ends of the lands, making those ends more impervious to water than the lower ends. These deposits, also, produce a slope lengthwise of the land. The tightening effect of the silt blanket must be counteracted so far as possible by the various methods of cultivation in use. The amount of desirable slope is influenced further by the kind of crop, alfalfa requiring more than crops which are irrigated between rows. But with clear or moderately clear water lands should never be graded entirely level."

Relations between physical constitution of soils and the distribution of irrigation waters, A. MÜNTZ and E. LAINÉ (*Min. Agr. [France], Ann. Forêts, Hydraul. [etc.]*, No. 44 (1912), pp. 1-130, pls. 7, figs. 9).—In continuation of previous studies on the relation of the physical properties of the soil to irrigation (E. S. R., 24, p. 522) the authors extended their investigations to include the module, and time, method, and amount of irrigation most favorable to crops, with particular reference to the design of irrigation works.

The permeability of the soils used in the experiments varied from an infiltration of 0.5 to 60 cm. (0.2 to 23.4 in.) per hour. In the module experiments it was found that for the less permeable soils the module should be such that the flow through the diversion gate is about 0.3 liters per second per meter of width of the irrigated parcel. For soils of average permeability this should be from 1½ to 2 liters per second and for extremely permeable soils should exceed 9 liters per second per meter of width of the irrigated parcel. It is also concluded in this connection that the improper choice of module is one of the main causes of failure in irrigation.

Irrigation experiments with hay crops showed that the most economical amount for an irrigation is an amount just sufficient to reach the extremities

of an irrigated plat, which amount should be predetermined for each plat on the basis of the physical properties of its soils. A greater amount than this is concluded to be a waste of water and more or less of an injury to the soil.

On the soils of varying permeabilities irrigation was found to be on the average most effective and practical when applied in predetermined amounts at intervals of seven or eight days. Very inferior results were obtained when irrigation water was applied at intervals of 15 days and of three weeks. It was further found that on these soils the necessary total quantity of water for crops computed on the basis of continual flow during the growing season varied from 0.23 to 0.85 liters per second per hectare according to the physical properties of the soil. The commonly assumed need for all soils of a continual flow of 1 liter per second per hectare is thought to be a great waste of water.

Irrigation, R. T. BURDICK (*Vermont Sta. Bul. 182 (1914), pp. 340-363, pls. 4*).—The author discusses the general topic of irrigation and states that vegetables, small fruits, and potatoes can be best irrigated in Vermont. He briefly describes various methods of applying water, including subirrigation and sprinkling. It is considered unsafe to apply more than 1 in. of water to crops at a time, owing to the uncertainty regarding rainfall. Brief descriptions of several irrigation plants in operation in the Eastern States are given and a list of references to related literature is appended.

Surface water supply of North Pacific coast drainage basins, 1911, F. F. HENSHAW ET AL. (*U. S. Geol. Survey, Water-Supply Paper 312 (1915), pp. 706, pls. 4*).—This report presents the results of measurements of flow made on the streams in the North Pacific coast drainage basin and their tributaries during 1911.

Surface water supply of the Great Basin, 1912, F. F. HENSHAW, E. A. PORTER, and G. C. STEVENS (*U. S. Geol. Survey, Water-Supply Paper 330 (1914), pp. 275, pls. 3*).—This report, prepared in cooperation with the States of Idaho, Utah, Oregon, California, and Nevada, presents the results of measurements of flow made in the Great Salt Lake, Sevier Lake, Thousand Springs Creek, Salton Sink, Owens Lake, Mono Lake, Walker Lake, Humboldt-Carson Sink, Pyramid Lake, Winnemucca Lake, Warner Lake, Albert Lake, Silver Lake, Mauheur Lake, Harney Lake, and Alvord Lake drainage basins during 1912.

Surface water supply of lower Columbia River and Rogue, Umpqua, and Siletz rivers, 1912, F. F. HENSHAW and E. S. FULLER (*U. S. Geol. Survey, Water-Supply Paper 332-C (1914), pp. 226*).—This report, prepared in cooperation with the States of Oregon and Washington, presents measurements of flow made on the lower Columbia River and the Rogue, Umpqua, and Siletz rivers during 1912.

Surface water supply of the Pacific coast in California, 1912, H. D. MCGLASHAN and G. C. STEVENS (*U. S. Geol. Survey, Water-Supply Paper 331 (1914), pp. 442, pls. 2*).—This report presents the results of measurements of flow made on streams in the northern and southern Pacific Ocean drainage basins and in the San Francisco Bay drainage basin during 1912. An article on Fluctuations in Ground-water Levels in the Valley of Southern California, by W. C. Mendenhall, is included.

Springs of California, G. A. WARING (*U. S. Geol. Survey, Water-Supply Paper 338 (1915), pp. 410, pls. 13, figs. 4*).—This is a popular catalogue of the spring waters of California, referring particularly to their chemical properties, and including analyses.

Profile surveys in Bear River basin, Idaho (*U. S. Geol. Survey, Water-Supply Paper 350 (1914), pp. 7, pls. 6*).—This report, prepared under the direc-

tion of R. B. Marshall, describes the general features of the Bear River basin and gives a plan and profile of the river from Riverdale to Novene, Idaho.

Profile surveys of Snoqualmie, Sultan, and Skykomish rivers, Washington (*U. S. Geol. Survey, Water-Supply Paper 366 (1914), pp. 7, pls. 12*).—In this paper, prepared under the direction of R. B. Marshall, the general features of the Snohomish River basin are described and plan and profile maps of the Snoqualmie, Sultan, and Skykomish rivers and certain of their tributaries are given.

Profile surveys of Missouri River from Great Falls to Three Forks, Montana (*U. S. Geol. Survey, Water-Supply Paper 367 (1914), pp. 8, pls. 13*).—This report, prepared under the direction of R. B. Marshall, describes the general features of the Missouri River basin and gives a plan and profile of the river from Great Falls to Three Forks, Montana.

The diaphragm method of measuring the flow of water in open channels of uniform cross section (*Engin. and Contract., 42 (1914), No. 18, pp. 414, 415, figs. 4*).—The diaphragm method is described and two examples of apparatus are illustrated.

German experiments with one apparatus using calibrated orifices to check the diaphragm method showed a close agreement and that the diaphragm gave accurate measurements with velocities as low as 0.02 ft. per second. Another test, using the current meter as a check, showed that the diaphragm gagings checked the meter gagings very closely, the greatest difference obtained by a direct comparison being 0.7 per cent.

The chief advantage of the diaphragm method is said to be the rapidity with which the measurement can be made. The disadvantages are that a channel of sufficient length and uniform section must be available and that the cost of installing the necessary apparatus is rather high.

List of references on water rights and the control of waters (*Washington: Library of Congress, 1914, pp. 111*).—It is the purpose of this list to bring together the more important discussions of the various claims put forth by conflicting interests, including irrigation and power development concerns and properties largely dependent for their value upon the continuance of natural stream flow, and to point out by means of an analytical index where information on any phase of the subject may be found.

Draining District 9, Mississippi County, Arkansas, L. L. HIDINGER (*Engin. Rec., 70 (1914), No. 17, pp. 455-457, figs. 2*).—The methods of design and execution of the work for an improvement involving 14,000,000 cu. yds. of dredged excavation to prevent river overflow and provide local drainage benefiting 300 square miles of land are presented.

The main features of the district plans are (1) protection from overflow from the Little River, (2) a system of lateral drainage through the entire territory, and (3) a system of outlet channels to carry to a final outlet the water collected in the lateral drains. A survey of the existing information regarding the run-off

of the district led to the development of the formula $R = \frac{28}{\sqrt{M}} + 7.2$, in which R

equals run-off in second-feet and M equals the area in square miles. The so-called fish-bone system of drainage was rejected owing to the fact that too large and unwieldy a channel would be necessary and would make the effective distribution of slope difficult. In its stead a 4-channel plan was adopted.

The estimated cost of the excavation was \$1,155,000.

Comparative steam and electric power layouts for a drainage pumping plant (*Engin. and Contract., 42 (1914), No. 18, pp. 412-414, figs. 5*).—Comparative plans and bidding prices for the two types of pumping plant are given with

descriptions of the essential structural features. The steam pumping plant bid was awarded the contract.

Building levees with the hydraulic dredge, J. M. ALLEN (*Engin. News*, 72 (1914), No. 18, pp. 891-893, figs. 3).—A description of the plant and methods used in building levees with hydraulic dredges on different rivers is given with cost data of the operation of a typical plant. See also a previous note by Yarnell (E. S. R., 32, p. 187).

Some methods and costs of cleaning drainage ditches, S. DEAN (*Engin. and Contract.*, 42 (1914), No. 18, pp. 415, 416).—A hydraulic jib outfit for removing silt from a drainage canal is described and cost data are given. Cost data are also given for the use of a small drag line excavator for the same purpose.

Country roads in southeastern Wisconsin (*Engin. Rec.*, 70 (1914), No. 17, pp. 448-450, figs. 5).—This article deals with state aid road construction, including innovations in the way of clay-bound macadam, high earth shoulders on narrow roads, and increased thickness of concrete of a richer mixture.

Blasting cultivation on moor soil, W. BERSCH (*Ztschr. Moorkultur u. Torfverwert.*, 12 (1914), No. 4, pp. 140-146, figs. 5).—In a review of various blasting experiments it is stated that soil breaking and drainage ditch digging in moor soil by means of explosives are unsuccessful owing to the fact that the circumference and depth of activity are too great and can not be so well controlled as in mineral soils.

Use of logging equipment for clearing land of stumps, H. P. JACOBSEN (*West. Engin.*, 5 (1914), No. 5, pp. 202-204, figs. 8).—The author shows how to regulate hauling lines in connection with a logging engine so as to clear a wide area with a single setting of equipment. Statistics of capacity are given.

Heat power machines or electric motors? E. JAENICHEN (*Maschinen Ztg.*, 12 (1914), Nos. 17, pp. 193-197; 18, pp. 201-204).—The author reports considerable data for the purpose of comparing the efficiency and economy under actual working conditions of steam and internal combustion engines and electric motors for general use on farms in Germany.

A summary of the data indicates that the internal combustion engine is the most efficient type of power for the smaller work about the farm. For short working periods the benzine or benzol engine is the most efficient, while for the longer working periods the naphthalin engine is the most efficient. For the heavier work of threshing, etc., the steam engine usually gives better results, although it is stated that for stationary power plants of about 30 horsepower where the exhaust steam of a steam engine can not be utilized the Diesel engine is superior.

The data in general are not favorable to the use on farms of electricity from central stations, and it is concluded in this respect that owing to the high cost of electricity the time has not yet come for its general use on farms.

Tractor and horse power, W. DINSMORE (*Breeder's Gaz.*, 66 (1914), No. 15, pp. 585, 586, fig. 1).—From observations of actual working conditions in the Northwestern States and in the Canadian northwest it is stated that for general farm operations the tractor has not proved successful from the standpoint of economy. Its most important use in those localities is said to have been the breaking of virgin prairie.

The use of tractors in Russia, F. DE CONDÉ (*Jour. Agr. Prat.*, n. ser., 28 (1914), No. 27, pp. 23-25).—Some of the results of Russian tests of steam and internal combustion tractors plowing with disk and moldboard plows are given in incomplete form.

Plans and detailed description of new dairy barn at the college farm, A. S. COOK (*New Jersey Stas. Rpt.* 1913, pp. 346-354, pls. 8).—A dairy barn designed

to provide space for hay storage and stable room for 40 cows is described and illustrated.

The general plan is not elaborate and is said to be well adapted to practically any conditions where milk is produced. The construction is of hollow tile with stucco on the outside and plaster inside. It is stated, however, that the same general plan may be followed with lumber. The barn is 127 ft. long and 36 ft. 8 in. wide. The ventilating system is of the well-known King type. The foundation and first floor are constructed of 1:3:5 concrete.

The first floor is divided into three separate parts. One section is divided into box stalls for cows and calves and bull pens. Another section, in which there are two rows of stalls with the cows facing in, is devoted to milch cows. A third section contains the milking room and medicine room.

The first floor equipment consists of iron pipe stanchions and partitions, both in the stalls and in the pens. The stanchion is of the swinging chain type and the stalls are 3 ft. 6 in. wide. The mangers are of galvanized iron and may be raised or lowered. A litter carrier is installed to carry the manure to the pit but feed is handled on trucks.

Conveniences for handling the farm cow and her products (*U. S. Dept. Agr., Office Sec. Spec. [Circ.], 1914, Dec. 31, pp. 6, figs. 10*).—This circular, by means of discussion and diagrammatic illustrations, gives popular information regarding the cow stall, calf stanchion, milk cans, milk room and cooling box, water heater, and equipment for washing dairy utensils.

Worth and uses of silos and silage (*Quart. Rpt. Kans. Bd. Agr., 33 (1914), No. 129, pp. 110-380, figs. 36*).—Practical information is given on the value, making, and use of silage, the materials therefor, and features for the construction of the silos most approved.

Details of construction and cost of vitrified tile silo, A. S. COOK (*New Jersey Stas. Rpt. 1913, pp. 334-344, pls. 5*).—The details of construction of the vitrified tile silo are described and illustrated and cost data given. This type of silo is considered to be one of the most substantial and efficient of the types used at present. The total cost of such a silo erected at the station, 12 ft. in diameter and 32 ft. high, was \$603.83.

Steam power versus electricity for filling silos (*Elect. World, 64 (1914), No. 19, p. 914, figs. 3*).—A rural community found that the daily rent, including cost of energy consumption, of a 15-horsepower electric motor with transformers mounted on a truck when used for filling silos was considerably less than the expense of using a traction engine. The electrical outfit was rented for \$5 per day, while the actual total cost of steam-engine drive was about \$12.50 per day. The average energy required per ton for silo filling was said to be 1.17 kilowatt hours.

The effects of the acid of silage on concrete, A. S. NEALE and W. S. CORSA (*Concrete-Cement Age, 5 (1914), No. 3, pp. 125*).—Both experimenters claim to have observed no injurious effects on the walls of concrete silos due to acids in the silage. It is stated that in case any bad effects are noticed washing with neat cement or coal tar dissolved in gasoline will overcome them.

Further studies in poultry house construction, H. R. LEWIS and A. L. CLARK (*New Jersey Stas. Rpt. 1913, pp. 259-271, pls. 4, fig. 1*).—This report describes and diagrammatically illustrates the so-called type L poultry house, known also as the New Jersey multiple unit laying house, developed at the station, and gives the results of studies of this and five other houses which are designated by the letters J, K, M, R, and P, and were described in a previous report (*E. S. R., 30, p. 389*).

Type J house is of the half monitor construction with an entire glass front in the peak and with the front left entirely open two feet above the ground and

covered with inch mesh wire. Type K house is of the half monitor construction with glass front and no muslin curtains. Type M house is of the shed roof type 8 ft. 2 in. high in front and 5 ft. 2 in. at the back and is built of 12 by 12 in. Natco hollow tile. Type R house is intended for a cheap shelter and is of the shed roof type 7½ ft. high in front and 4 ft. in the back. Each unit of the type L house is a square house 20 by 20 ft. and gives a capacity of 100 hens. The house is only single boarded on all four sides except at the rear and above the dropping boards and perches. About this space sheathing boards are also closely nailed to the side of the back studs and rafters. The front of the house is largely taken up by the curtains and windows, the former being hinged at the top and the latter at the side. A distinct feature of the house is a large dry mash hopper placed every 40 ft.

The studies were made for the purpose of securing data on cost of material, temperature variations, moisture conditions, food consumption, egg production, and total net profit.

It was found that a type resembling house L meets more nearly all the ideal conditions and that type K represents everything which is undesirable. As a result of the studies the houses are classed in the following order of excellence: L, R, J, P, M, and K.

In addition, the New Jersey portable breeding house is described and diagrammatically illustrated.

Cooking-boilers on poultry farms, J. HADLINGTON (*Agr. Gaz. N. S. Wales, 25 (1914), No. 10, pp. 898-900, figs. 4*).—These are briefly described and illustrated diagrammatically.

Ice houses and the use of ice on the dairy farm, J. T. BOWEN and G. M. LAMBERT (*U. S. Dept. Agr., Farmers' Bul. 623 (1915), pp. 24, figs. 18*).—This discusses the use of ice on the dairy farm for the keeping of milk and cream and gives plans and specifications for ice houses.

It is pointed out that wherever ice is abundant the cost of harvesting and storing is usually very small. "The dairyman should consider both the cost of construction and the cost of the ice in selecting the type [of house] most suitable for his requirements."

As regards insulation it is stated that "an air space 1 in. wide is practically as good as one 12 in. wide. Air circulation is valuable, however, between the insulated ceiling and the roof of an ice house in order to break up the heat radiation through the roof. No entrance or exit of air should be allowed to take place in a room where ice is stored, especially at or near the ground line, as the cold currents of air at the bottom will filter through. . . . The building should be so constructed that there will be a circulation of air through the outer walls and at the eaves to the ventilator on the roof, as these air currents tend to break up the heat radiation through the walls and roof. . . .

"Ice should never be placed directly on the ground, soil being a fairly good conductor of heat, especially when wet. . . . In houses that have the floor below the level of the ground, sufficient drainage usually can be obtained through the soil, especially if the soil is porous. It may be necessary, however, with a clay soil, to excavate a foot or two and fill in with cinders or gravel, and to place a 3-in. porous tile under the floor. This drain should be properly trapped or sealed to prevent warm air from entering the building through the floor. . . .

"It is of the utmost importance that brick, concrete, and wooden buildings be waterproofed. Brick and concrete work may be rendered waterproof by painting the outside of the wall with white lead and oil or by coating the walls with a preparation of paraffin or asphalt. . . .

"About 40 cu. ft. of space should ordinarily be allowed for a ton of ice. . . .

"Under general conditions about 1 lb. of ice will be required to cool and keep 1 lb. of cream in good condition until delivered to the creamery when deliveries are made three times a week. When storing ice about 50 per cent more should be packed than is actually needed. This amount allows for a heavy shrinkage and for household uses. The dairy farmer should provide annually $\frac{1}{2}$ to 1 ton of ice per cow for cooling cream only and $1\frac{1}{2}$ to 2 tons per cow if whole milk is cooled, depending upon the locality and other factors. If a cake of ice is kept floating in the water surrounding the cream cans when the ordinary cooling cans are used, the temperature will remain at about 40° F. Good ice-water tanks can usually be constructed for from \$5 to \$20."

Ventilation of farm buildings, J. H. GRISDALE and E. S. ARCHIBALD (*Canada Expt. Farms Bul.* 78 (1914), pp. 32, figs. 23).—This bulletin deals with the ventilation of cow and horse barns and piggeries and reports comparative studies of several systems of ventilation, including the Rutherford and King systems.

For the horse and cow barns it is stated that the Rutherford system has proved much superior to any other tried, while for piggeries the Rutherford and the modified Rutherford systems were both found to be uniformly satisfactory. The essential features of the systems recommended are described and diagrammatically illustrated.

Cooling two rooms in a country residence, A. M. FELDMAN (*Heating and Ventilating Mag.*, 11 (1914), No. 3, pp. 33, 34, figs. 2).—Two rooms in a country residence were cooled by installing a cork-insulated box in the attic immediately above the rooms. The top of the box was connected with a short duct to the roof for taking in fresh air and the bottom was connected to the ceiling registers of the two rooms. Fresh air enters the top of the box, is cooled by coils from a small refrigerating plant for the pantry and kitchen, and drops by gravity through the registers to the floor of the rooms.

RURAL ECONOMICS.

A rural survey in southwestern Ohio, P. L. VOGT (*Miami [Ohio] Univ. Bul.*, 11 ser., No. 8 (1913), pp. 93, figs. 17).—According to the author, among the principal problems awaiting solution in the areas studied are the decrease in church membership, especially among young persons, a nonresident ministry, a lack of organized rural recreation, inadequate rural school equipment and teaching force, and the breaking up of the homogeneity of rural population through the growth of tenantry, increase of foreign population, and change in type of farm labor. Among the constructive tendencies noted were the gradual increase in rural culture and in interest in the problems of rural life and co-operative enterprises. The author suggests, as some of the changes to be brought about, the reorganization of the church and rural school system, the encouragement of farm organizations, the development of pride in rural life and institutions, and the provision for social and recreational life of the rural communities.

The Minnesota Crop Improvement Association (*Ann. Rpts. Minn. Crop. Improv. Assoc.*, 8-11 (1911-1914), pp. 91, figs. 14).—This report contains abstracts from addresses made before the association, and relates principally to the effects of seed selection upon profitability of farming and to the various agencies tending toward the improvement of rural conditions.

Practical community studies (*Bul. Univ. Ga.*, No. 228 (1914), pp. 44).—This outline contains a limited syllabus of educational and social topics planned for elementary and preliminary studies in specific localities. The subjects are divided into those primarily urban and rural and those relating to general social problems and to sociological theory.

Social and civic work in country communities, ELLEN B. McDONALD, ROSA M. CHENEY, and G. F. COMINGS ([*Wis. State Supt. Pub. Instr.*] *Bul.* 18 (1913), pp. 138, figs. 20).—This bulletin is the report of a subcommittee appointed to investigate conditions in the rural schools of Wisconsin and treats of the relationships between the home, the school, and the community, and outlines methods for making these relationships effective and helpful along the lines of community improvement.

Agricultural survey, 1913, F. C. NUNNICK (*Com. Conserv. Canada Rpt.*, 5 (1914), pp. 142-174, pls. 4).—The committee on lands of the Canadian Commission on Conservation conducted agricultural-survey work in 29 districts in Canada and noting the crops grown, rotations followed, seed selection, manures used, insect and plant diseases, fuel, power and water supply, and live stock and labor conditions. These pages give the details by districts.

Full report of the Royal Commission on Agriculture (*Brit. Columbia Rpt. Roy. Com. Agr.*, 1914, pp. IX+398, figs. 3).—Part 1 of this report discusses conditions in British Columbia as they relate to the public and private lands, land and public improvements, taxation, labor, agricultural credit, marketing and cooperation, and agricultural education, and contains a summary of the hearings held by the commission in various points in the Province. Part 2 describes the agricultural conditions and types of farming in British Columbia and cooperation and agricultural credit in European and other countries.

Annual report on the working of cooperative societies in the Bombay Presidency, 1914 (*Ann. Rpt. Work. Coop. Soc. Bombay Pres.*, 1913-14, pp. II+78+3).—This report reviews the progress made and outlines the working of the central societies and unions of the agricultural and nonagricultural societies and other forms of cooperation in the Bombay Presidency. Statistical tables are given showing membership, receipts and disbursements, assets and liabilities, and profit and loss of individual societies.

The farmers' elevator movement, I, II, O. N. REFSELL (*Jour. Polit. Econ.*, 22 (1914), Nos. 9, pp. 872-895; 10, pp. 969-991).—The author describes the various methods of selling grain through elevators and track buyers, the alleged methods used by line elevator companies to drive the independent farmers' elevators out of business, and the methods that have been devised to meet their competition at Rockwell, Iowa. The farmers at this place formed an elevator company, the by-laws of which contain a penalty clause which provides that members are to pay into the treasury of the company $\frac{1}{2}$ per cent bushel for every bushel of grain sold either to the company or to its competitors. By the means of this payment the company has been able to exist in spite of all outside competition. This system became somewhat of a model for other farmers' elevator companies. Later, it is stated, boycotted commission firms, because of the harmful effect produced on their business by the work of the regular grain trade, began to cooperate actively with the farmers' elevator companies to bring about a more rapid spread of the movement. State associations were formed which accelerated the building of this kind of elevator and gave additional strength to the individual company. The author points out various methods said to have been used in attempting to force the new type of company out of business.

Farmers' market bulletin (*Farmers' Market Bul.* [N. C.], 2 (115), No. 1, pp. 26).—This is a continuation of the series previously mentioned (E. S. R., 31, p. 894) and contains a partial list of merchants who purchase produce outside of the State and the commodities handled by each, and a partial list of farmers with farm products for sale indicating quantity and kind.

Money crops in place of cotton, E. R. KONE (*Texas Dept. Agr. Bul., n. ser., No. 13 (1914), pp. 27, pl. 1*).—This bulletin outlines a system of farming for the different sections of Texas designed to give the farmer practical money crops and a source of revenue which may be in part a substitute for cotton.

Cost of grain production in Canada, 1913 (*Census and Statis. Mo. [Canada], 7 (1914), No. 76, pp. 299-306*).—A special inquiry, conducted through the crop-reporting correspondents, as to the cost of grain growing in Canada is reported, with data as to the cost of the various items for fall and spring wheat, oats, barley, flax, and corn in the various Provinces.

The movement of prices during recent years, A. MARIOTTI (*Atti. R. Ist. Incorogg. Napoli, 6. ser., 65 (1913), pp. 183-250*).—The author compares the index of prices of the principal agricultural products in England, Germany, France, Belgium, the United States, and in the city of Naples. The principal part of the discussion relates to changes since 1900.

Return of prices of crops, live stock, and other Irish agricultural products (*Dept. Agr. and Tech. Instr. Ireland, Agr. Statis. 1913, pp. 79, pls. 17, fig. 1*).—This report contains information along the lines previously noted, but with reference to 1913 (E. S. R., 30, p. 297).

The agricultural outlook (*U. S. Dept. Agr., Farmers' Bul. 645 (1914), pp. 45, figs. 2*).—This issue contains the final estimates in detail for the crop year 1914. The total area harvested for 14 crops for which estimates are included was 300,782,000 acres and comprised 92 per cent of the entire cultivated area of the United States and being 0.1 per cent larger than in 1913 and 2.4 per cent larger than in 1912. The total production was 10 per cent larger than during 1913 and 6 per cent smaller than for 1912. The average value per acre of these crops was \$16.44 for 1914, \$16.52 for 1913, and \$16.15 for 1912, and the total values were \$4,946,000,000, \$4,966,000,000, and \$4,759,000,000, respectively. The estimated value of all crops was \$6,044,480,000, \$6,132,750,000, and \$5,842,220,000, respectively, and of animals and their products \$3,828,456,000, \$3,656,866,000, and \$3,500,570,000, respectively.

It is estimated that the cotton States on the average produce 46 per cent of their total wheat requirements, 86 per cent of their corn, 75 per cent of their oats, and 79 per cent of their hay. To produce the remainder would require 15,000,000 acres.

The purchasing power of the farmer is discussed by N. C. Murray. It is estimated that from 1899 to 1909 the money value of one acre of the farmer's crops increased 72.7 per cent but in the same period the money value of the articles usually purchased by the farmer increased 12.1 per cent. In 1913 the value of one acre of the farmers' crops averaged about 1.2 per cent higher than in 1909, but the value of articles purchased by the farmer has advanced in the same time about 5.7 per cent.

Among the other phases of crop statistics discussed were the winter wheat and rye sowing and condition, the apple crop, a forecast of sugar production in Louisiana, onion and cabbage statistics, trend of farm prices, shipments of California barley to New York, cold-storage holdings of apples, and the wheat crop of the southern hemisphere.

Statistical tables are included showing the estimated acreage, yield per acre, total production, average price and value December 1 for the principal crops for 1914, with comparative data for earlier years. Additional statistical tables are included relating to subjects discussed in the text.

Agricultural statistics of Denmark (*Statis. Aarbog Danmark, 19 (1914), pp. 26-29, 36, 44-52*).—This yearbook contains information along the lines previously noted regarding agricultural work and the number of farms in Denmark, including data for 1913 concerning the use of land (E. S. R., 30, p. 392).

Census of agriculture in Greece (*Recense. Agr. Grèce, 1911, pts. 1, pp. XVI+1-141; 2, pp. VIII+143-267*).—These reports give statistics showing by Provinces the area in crops for 1911 for Thessaly, Arta, and the Ionian Islands.

AGRICULTURAL EDUCATION.

Agricultural education, R. H. FORBES and A. M. McOMIE (*Arizona Sta. Rpt. 1913, pp. 286-296*).—An account is given of the scheme of agricultural education in Arizona, comprising academic courses in high and normal schools and the state university; extension instruction, including a demonstration train, a two weeks' farmers' short course held annually at the university, and farmers' institutes; and advisory relations, including correspondence between the station staff and farmers, and a farm management service in process of organization.

Fifth annual report of the eleven district agricultural schools of Georgia, J. S. STEWART (*Bul. Ga. State Col. Agr., 2 (1914), No. 13, pp. 35, figs. 4*).—This report contains reports of these schools, including an outline of the course of study, and tables showing the enrollment, expenses, equipment, farm products, etc.

The training and certification of teachers for agricultural, industrial, and household arts subjects in the public schools of Indiana, W. F. BOOK (*Dept. Pub. Instr. [Ind.], Ed. Pubs., Bul. 5 (1914), pp. 36*).—The author discusses the need of trained teachers for pre-vocational work, the general character and aim of the work, qualifications and training of teachers and agencies available for training them, and standards that must be met by schools offering training courses in pre-vocational subjects, and outlines summer school work, profitable courses for principals and superintendents, and teachers' training courses in domestic science and industrial arts.

Tentative course of study in industrial subjects for the public schools of Indiana (*Dept. Pub. Instr. [Ind.], Ed. Pubs., Bul. 2 (1913), pp. 203*).—This bulletin discusses the aim, scope, and problems of vocational work in the public schools of Indiana; offers general suggestions and helps in conducting this work in the grades from the kindergarten through the high school and in special departments and schools, and tentative outlines for work in agriculture, domestic science, and industrial arts; and gives lists of suggestive references on vocational and industrial education and of equipment.

Report of agriculture in the high schools of Michigan, W. H. FRENCH (*Mich. Agr. Col., Dept. Agr. Ed. Bul. 13 (1914), pp. 14, pl. 1, figs. 9*).—This bulletin gives brief reports on the agricultural work in Bay City, Escanaba, Manistee, and Muskegon, home projects, the Houghton Township School, the effect of teaching agriculture on the school and community, boys' and girls' club work, and general suggestions as to means and methods of improving the work in agricultural instruction in the high school. A statistical table shows that 31 high schools offered one or more years of agricultural work to 1,000 boys and 356 girls, and approximately 500 boys and girls worked at home projects during the summer of 1914. Seventeen schools offered one-week courses for farmers and 16 had a total of 31 boys' and girls' clubs.

Twenty-first annual report of the inspector of state high schools of Minnesota, G. B. AITON (*Ann. Rpt. Insp. State High Schools Minn., 21 (1914), pp. 51*).—For the year ended July 31, 1914, 119 high schools received a total state aid of \$237,853 for instruction in agriculture. Agriculture was taught in 134 high schools, cooking in 165, and sewing in 179 to 4,053, 5,799, and 6,680 students, respectively. The total expenditure for agricultural equipment was \$40,558,

and for cooking and sewing equipment \$55,144. Statistical tables show the enrollment and expenditures for agriculture and home economics instruction.

Vocational education in Pennsylvania (*Penn. Dept. Pub. Instr., Vocational Div. Bul. 1 (1913), pp. 27*).—This bulletin contains the text of the law enacted in 1913 providing state aid for vocational, industrial, agricultural, and household arts schools and departments, an interpretation of the law, rules and regulations to be applied, methods of putting the new statute into effect, etc.

Agricultural schools and departments (*Penn. Dept. Pub. Instr., Vocational Div. Bul. 2 (1913), pp. 15*).—This bulletin discusses conditions and requirements with reference to organization, qualifications of teachers, courses of study, project work, summer employment of teachers, use of land, rooms and equipment, etc., governing agricultural schools and departments desiring to qualify for state aid.

Household arts schools, departments, and evening classes (*Penn. Dept. Pub. Instr., Vocational Div. Bul. 4 (1913), pp. 18*).—This bulletin considers in detail those parts of the vocational education law of Pennsylvania that relate to household arts education, including suggestive outlines and a description of 4-year, 2-year, and evening courses, and a plan of procedure for organizing evening classes.

Correlating agriculture with the public-school subjects in the Southern States, C. H. LANE and E. A. MILLER (*U. S. Dept. Agr. Bul. 132 (1915), pp. 41, figs. 9*).—The authors present a scheme by means of which the rural or public school teacher may utilize clubs in correlating agriculture and farm-life problems with the regular school work. For the purpose of this scheme public school classes are divided into two groups, including grades 1 to 5 and 6 to 8, respectively. The subject matter outlined is arranged according to a monthly sequence plan, 9 months' work being provided for. Directions are included for organizing boys' and girls' clubs, securing literature, selecting, storing, and testing seed, planning school gardens, and making school exhibits, including score cards. Suggested problems in arithmetic are added.

Course of study in agriculture for the public schools of Oregon, F. L. GRIFFIN (*Salem, Oreg.: State Dept. Ed., 1914-15, pp. 79*).—An agricultural course for the eighth grade is outlined in seasonal sequential order. It comprises a series of lessons of from 20 to 30 minutes each a day in orchard, field, and garden crops, beneficial and injurious insects, plant diseases, weeds, poultry husbandry, dairying, animal husbandry, farm management and machinery, forestry, and the country home and its surroundings. The lessons are accompanied by suggestions and directions for practical exercises, at least one for each week. A list of references is included.

Outlines of nature study and elementary agriculture, M. J. ABBEY (*Salt Lake City: Univ. Utah, 1913, pp. 103*).—In this bulletin the author discusses the correlation of nature study with other school subjects, and outlines the work in nature study and elementary agriculture, including typical lessons from the first to the eighth grades, inclusive. The course in elementary agriculture for the seventh and eighth grades may also be used, with slight modifications, as an elementary high school course.

Agriculture in elementary schools (*Augusta, Me.: Dept. Ed., 1914, pp. 28*).—This circular contains an outline for the study of school and home gardening, together with laboratory exercises, exercises in soils and plant growth for the rural schools in Maine, and suggestions concerning the organization of boys' and girls' agricultural clubs.

Helps for teachers in agriculture: Soils, M. L. FISHER (*Purdue Univ. Dept. Agr. Ext. Bul. 31 (1914), pp. 12*).—The author outlines soil studies for the seventh and eighth grades of the Indiana public schools for 1914-15.

Helps for teachers in agriculture: Farm crops, M. L. FISHER (*Purdue Univ. Dept. Agr. Ext. Bul. 30* (1914), pp. 12, figs. 7).—Corresponding to the above, this bulletin gives a brief discussion, with suggestions for laboratory and field work, of wheat seeding, nodules of legumes, wheat stooling and the Hessian fly, rotations, cowpeas and soy beans, oats, potatoes, and corn growing.

Helps for teachers in agriculture (*Dept. Pub. Instr. [Ind.], Ed. Pubs., Bul. 12* (1914), *Vocational Ser. 7, pts. 1, pp. 14; 2, pp. 14*).—This bulletin comprises two leaflets which contain detailed outlines for the months of September to December, inclusive, on Soils and Poultry, prepared by Z. M. Smith, Horticulture and Dairying, by J. D. Harper, and Animal Husbandry and Crops, by F. M. Shanklin. No one teacher is expected to use all the material outlined, each county superintendent of schools selecting one or two subjects for his county.

Laboratory exercises in farm mechanics for agricultural high schools, D. SCOATES (*U. S. Dept. Agr., Farmers' Bul. 638* (1915), pp. 26, figs. 26).—These exercises in rope work, farm power, farm buildings and machinery, surveying, tile drains, terracing, irrigation, and roads, are suggested to serve as a guide to the teacher of high school agriculture. Brief notes are given on library and laboratory equipment.

Planning and serving meals, NEALE S. KNOWLES and LOUISE H. CAMPBELL (*Iowa State Col. Agr. Ext. Dept., Home Econ. Circ. 1* (1913-14), pp. 29, figs. 7).—This circular contains a study of the nutritive value of foods; suggestions with regard to the choice of foods to suit the needs of the family, preservation and public care of foods, and serving meals; and a price list of kitchen utensils.

Home furnishing, WINIFRED A. GETTEMY (*Iowa State Col. Agr. Ext. Bul. 17* (1913), pp. 36, figs. 19).—The author discusses the construction of a house and its decoration and furnishing.

Textiles, NEALE S. KNOWLES and LOUISE H. CAMPBELL (*Iowa State Col. Agr. Ext. Dept., Home Econ. Circ. 2* (1913-14), pp. 16, figs. 7).—This is a study of textiles including classification, structure of fibers, characteristics, tests, and methods of adulteration of cottons, linens, woolens, and silks, methods of removing stains, width of textiles, some points in selecting textiles, the Consumers' League, and references for study.

Home economics study classes, ROBERTA McNEILL (*Purdue Univ. Dept. Agr. Ext. Leaflet 54* (1914), pp. 6, fig. 1).—This leaflet gives suggestions for organizing home economics study classes among farm women "to help each other to make better homes and to have more joy in living."

Suggestions for household exhibits (*Iowa State Col. Agr. Ext. Dept., Home Econ. Circ. 4* (1913-14), pp. 8, fig. 1).—Entries and score cards are suggested.

School exhibits, H. E. ESWINE and TREVA KAUFFMAN (*Agr. Col. Ext. Bul. [Ohio State Univ.], 9* (1914), No. 9, pp. 16, figs. 15).—The authors suggest agricultural and home economics material suitable for display at school exhibits and how best to select and prepare specimens.

Boys' and girls' home economics clubs, LAURA COMSTOCK and ETHEL H. NASH (*Mass. Agr. Col., Dept. Agr. Ed. Circ. 30* (1914), pp. 40, figs. 9).—This is a program of instruction in home economics club work, including cookery, canning and preserving fruit and vegetables, table serving, sewing, darning or mending, and other household activities.

Nebraska boys' and girls' clubs, Course I, twelve lessons on foods and their preparation, ORPHA E. NESBIT (*Univ. Nebr., Col. Agr. Ext. Bul. 17* (1913), pp. 80, figs. 3).—One lesson in foods and their preparation is outlined for each month in the year for girls' clubs. Most of the work is done by the girls at home.

Nebraska boys' and girls' clubs, Course I, twelve lessons in sewing, MARY E. BROWN (*Univ. Nebr. Col. Agr. Ext. Bul. 16 (1913), pp. 55, figs. 29*).—The author outlines 12 lessons in sewing corresponding to the above.

Organization of Nebraska boys' and girls' clubs, HULDAH PETERSON (*Univ. Nebr. Col. Agr. Ext. Bul. 10 (1913), pp. 12, figs. 2*).—This bulletin contains suggestions for organizing local, county, state, and national clubs, including a local constitution and outlines of boys' and girls' club work for 1913.

Report of the department of agricultural extension, A. AGEE (*New Jersey Stas. Rpt. 1913, pp. 379-383*).—The organization and work of the department of agricultural extension of the New Jersey State Station, established December 1, 1912, are described.

The agricultural college brought to the farm (*Facts for Farmers [Mass. Agr. Col.], 5 (1914), No. 2, pp. 4*).—Some of the most important lines of extension work being conducted by the Massachusetts Agricultural College are briefly outlined.

MISCELLANEOUS.

Twenty-fourth Annual Report of Arizona Station, 1913 (*Arizona Sta. Rpt. 1913, pp. 233-296, pl. 1, figs. 3*).—This contains the organization list, an administrative report by the director on the work and publications of the station, a financial statement for the fiscal year ended June 30, 1913, and departmental reports, the experimental features of which are for the most part abstracted elsewhere in this issue.

Annual Report of New Jersey Stations, 1913 (*New Jersey Stas. Rpt. 1913, pp. XXVIII+815, pls. 97, figs. 11*).—This contains the organization list of the stations, a financial statement for the State Station for the fiscal year ended October 31, 1913, and for the College Station for the fiscal year ended June 30, 1913, a report by the director, and departmental reports, the experimental features of which are for the most part abstracted elsewhere in this issue. Reports of the fertilizer inspection have been noted in Bulletins 259 (E. S. R., 30, p. 327) and 261 (E. S. R., 31, p. 126), and feeding stuffs in Bulletin 253 (E. S. R., 29, p. 665) and the text of the lime-inspection law.

Reports of the Edgeley, North Dakota, substation, 1905-1913, O. A. THOMPSON and J. H. SHEPPERD (*North Dakota Sta., Rpts. Edgeley Substa. 1905, pp. 20, pls. 2; 1906, pp. 30, pls. 5; 1907, pp. 38, pls. 9; 1909, pp. 55, figs. 6; 1910, pp. 47, figs. 15; 1912, pp. 50; 1913, pp. 20*).—These reports give data as to temperature and rainfall and brief summaries of the lines of work at this substation during the periods indicated. The experimental work reported is for the most part abstracted elsewhere in this issue.

Annual Reports of the Langdon, North Dakota, substation, 1909-1913, E. D. STEWART and J. H. SHEPPERD (*North Dakota Sta., Rpts. Langdon Substa. 1909, pp. 12; 1910, pp. 19, figs. 4; 1911, pp. 29, figs. 5; 1912, pp. 32, figs. 6; 1913, pp. 26, figs. 4*).—These reports give brief summaries of the lines of work at this substation during the periods indicated. Those for 1911, 1912, and 1913 also contain meteorological data. The experimental work reported is for the most part abstracted elsewhere in this issue.

Twenty-seventh Annual Report of South Carolina Station, 1914 (*South Carolina Sta. Rpt. 1914, pp. 33*).—This contains the organization list, a report of the director on the work and publications of the station, a financial statement for the fiscal year ended June 30, 1914, and departmental reports, of which that of the horticulturist and the botanist and plant pathologist are abstracted elsewhere in this issue. The report of the association agronomist contains brief cultural notes on cotton, Fulghum oats, Sudan grass, Abbruzzi rye, and beardless barley.

NOTES.

Connecticut College.—According to a note in *New England Homestead*, a requirement of at least three months of actual farm work of approved grade before graduation has been adopted. Paul W. Graff, a graduate of the college, has been appointed assistant in botany.

Kansas College.—A scholarship of \$300 per year has been offered by L. M. Crawford, of Topeka. The scholarship is to be in the division of general science, the donor's preference being that its holder elect courses chiefly in agriculture, if a man, and in home economics if a woman.

Massachusetts College.—A major in rural journalism has been authorized, beginning with the fall semester.

The enrollment at the winter school reached 180. Of these 25 per cent had attended or graduated from other colleges.

Minnesota University and Station.—The appropriations requested for the university for the ensuing biennium aggregate \$3,212,450, of which 35 per cent is for the agricultural work. Among the items is one of \$45,300 to enlarge and equip the new home economics building, which is already proving inadequate to accommodate the 515 students registered.

Howard R. Smith, professor of animal husbandry and animal husbandman, has resigned to become live-stock lecturer and specialist for a national bank in St. Paul.

Nebraska University and Station.—Under an act passed by the last legislature about \$700,000 will be available for the erection of agricultural buildings and equipment during the next four years. Plans for a dairy building have been completed, and an agricultural engineering building approximately 200 feet square is under consideration.

The agricultural science group in the college curriculum has been superseded by a general agricultural group, the first two years of which are prescribed and the remainder largely elective. Beginning next September students may take the entire college course at the university farm, or, if preferred, the academic and general science studies may be taken at the university. The agricultural practice group has also been rearranged and shortened to two years by the elimination of practically all nonagricultural subjects. A certificate of proficiency in farm practice is to be awarded at the completion of this course to students sufficiently experienced in practical farm work and to others on complying with practice requirements on farms. It is expected that this change will make it unnecessary for high-school graduates to enter the school of agriculture, and by providing practical farm training at once will greatly increase the registration in the college of agriculture.

Dr. Charles Edwin Bessey, head of the department of botany and head dean and distinguished as a leader in botanical education and research for many years, died February 25 at the age of 70 years. Dr. Bessey was born on a farm at Milton, Ohio, and graduated from the Michigan College in 1869. He received the M. S. degree in 1872 from the same institution, that of Ph. D. from the State University of Iowa in 1879, and that of LL. D. from Iowa College in 1898. He also studied two years with Dr. Asa Gray, of Harvard University.

Dr. Bessey's long career as a teacher began in 1870, when he was appointed professor of botany at the Iowa State College. He remained in this position

until 1884, also serving for a time as acting president. In that year he went to Nebraska as professor of botany, also serving as acting chancellor at various periods and as head dean since 1909.

In addition to these duties Dr. Bessey was botanical editor of the *American Naturalist* from 1880 to 1897 and of the same department of *Science* since 1897. He was president of the American Association for the Advancement of Science in 1910-1911; the Botanical Society of America, 1895-1896; Society for the Promotion of Agricultural Science, 1889-1891; the Department of Natural Science of the National Education Association, 1895-1896; and the American Microscopical Society in 1902; and was a member of a long list of other associations. He was the author of several books, including *Botany for High Schools and Colleges*, 1884; *Elementary Botanical Exercises*, 1892; *Elementary Botany*, 1904; and *Plant Migration Studies*, 1905, as well as of a large number of scientific papers and reviews.

Dr. Bessey's services to the university were of unusual importance, and have had an enduring influence on its development. He was a strong believer in the necessity of the broadest essential preparation of agricultural workers. In his long service he trained many botanists of prominence in this Department and elsewhere, and as a recent tribute states "their achievements form the greatest monument that can be erected to his memory. Present-day students will do well to remember that the success of his students is in large part due to the scientific spirit with which he has imbued them."

New Jersey College and Station.—Recent appointments include Erwin C. Van Leer as assistant herdsman in the dairy department, vice John W. Bartlett, who has been made field assistant in horticulture in place of Joel P. Sherman, resigned, Roscoe W. De Baun as extension specialist in market gardening, and Winifred N. Cowgill as field assistant in horticulture. The death of the college and station treasurer, Irving S. Upson, is noted.

Pennsylvania College.—The *Penn State Farmer* announces that a farmer's week held in Philadelphia was attended by over 800. A similar program for Pittsburgh is under consideration.

South Carolina College and Station.—The legislature has elected B. H. Rawl of the Dairy Division of this Department, to succeed W. D. Garrison, resigned, as a member of the board of trustees.

W. W. Fitzpatrick, formerly of the farm improvement department of the Southern Railway, has been appointed assistant dairyman in charge of field demonstrations in South Carolina, with headquarters at the college.

As one of its Smith-Lever projects, the extension division is organizing co-operative cream routes in near-by counties. The cream is shipped to the college, manufactured into butter, and marketed for the farmers. The plan has proved successful in its first six months, and recently egg gathering has been begun on the routes. The dairy equipment has been increased by the installation of a churn of 600 lbs. daily capacity.

Tennessee University and Station.—The will of the late Colonel Benjamin Rush Strong, a resident of Knoxville, contains bequests to the university of \$35,000 for the purchase of additional land for the station, \$30,000 for a girls' dormitory, and a business house in Knoxville, the income from which is to constitute a medal fund for the university and certain other institutions of learning. It also provides that the residue of the estate from these and many other bequests is to be given to the university as a trust fund for loans to deserving students of the agricultural department. The amount available for this loan fund is not definitely known, but is estimated at from \$200,000 to \$400,000.

EXPERIMENT STATION RECORD.

VOL. XXXII.

MAY, 1915.

No. 7.

A notable publication has been issued from the Ohio Experiment Station which on account of an attitude it represents is worthy of special comment. It is entitled *A Review of the Literature of Phosphorus Compounds in Animal Metabolism*, and is the work of Dr. E. B. Forbes and Miss M. Helen Keith. It is a highly important contribution to our literature of agricultural investigation, and one which not only the authors and the station issuing it but the American system of stations may well be proud of. The lesson it carries in the preparation for research has wide application.

Soon after Dr. Forbes went to the Ohio Experiment Station eight years ago, he began a series of investigations into the relations of mineral constituents in animal nutrition. Although these studies are of quite technical character and do not insure direct practical results at once, he has been supported in his undertaking and has gradually secured facilities for the work which are hardly equaled anywhere.

The broad interest of agricultural science in the whole question of the mineral elements lies, as Dr. Forbes explains, "in that larger intermediary metabolism between the soil and the sea which begins with the weathering of the rocks, includes the whole of plant and animal metabolism, and ends with the formation of new rocks."

In its relation to animal life, phosphorus stands out as an unusually conspicuous member of this group. No other inorganic element enters into such a diversity of compounds and plays as important a part in so many functions. "Structurally, it is important as a constituent of every cell nucleus and so of all cellular structures; it is also prominent in the skeleton, in milk, in sexual elements, glandular tissue, and the nervous system. Functionally, it is involved in all cell multiplication, in the activation and control of enzym actions, in the maintenance of neutrality in the organism, in the conduct of nerve stimuli, and through its relation to osmotic pressure, surface tension, and imbibition of water by colloids it has to do with the movement of liquids, with the maintenance of proper liquid contents of the tissues, with cell movements, and with absorption and secretion."

The study of the mineral elements in relation to nutrition is a subject but recently taken up by our stations, and the large measure of the world investigation bestowed upon it has been reported since the

beginning of the present century. It extends back, however, for as much as two hundred years, and the literature of the last fifty years is quite voluminous. From the fact that the subject has been approached from the medical and the physiological, as well as the agricultural and nutrition standpoints, the papers relating to it are unusually widely scattered.

At an early stage Dr. Forbes' studies naturally led him into the literature, and showed how difficult of access and study it was in its widely diffused condition. With an industry and zeal which deserve to be highly commended he instituted a systematic search for original articles bearing on the subject of investigation, which soon developed into a large undertaking. The assistance of several competent persons was obtained in abstracting, and the search was organized to be carried on at various libraries and institutions over the country. The work was in active progress for several years, and the bulletin now published is the result, the data being compiled and digested by Dr. Forbes after it had been assembled from various sources. In scope and size it surpasses all expectations of those who had known of its progress—a volume of seven hundred and fifty pages, with the abstracts grouped by topics, accompanied by concise summaries, a bibliography of approximately twenty-five hundred titles cited in the text, referring to work ranging in date from 1719 to 1914, and concluding with a detailed index.

The review will not only aid Dr. Forbes in his studies, but it will be well-nigh indispensable to those engaged in work in this field or who may enter upon it. It will at once take place as a standard work and become a starting point for future investigation in this and related lines. It will serve from now on to make investigation more clearly directed and more effective. It would be surprising if it did not stimulate research in this general subject, for it opens up the field in a most attractive way, making apparent not only the progress which has been attained but the gaps that remain to be filled.

The publication of this monumental work represents a broad-minded, liberal attitude, which stands for the community of interest in investigation and seeks its advancement rather than personal advantage.

When an investigator takes the pains to collect and digest the literature of his chosen field, as a part of a general program of experimentation in that field, we feel that he has gone at his work aright and commend him for his determination to build upon the foundation laid by the work of others. And when an experiment station not only authorizes the time and other expense for such a review of the past, but in addition publishes it for the benefit of the

world, we commend the courage of its convictions and feel a new assurance that agricultural investigation at the experiment stations is not to be bound by any narrow view or impatient demand. Such an attitude evidences a deep appreciation of research as thorough and enlightened as present knowledge permits. It shows a determination not only to make its work thorough but constructive, adding to the sum of knowledge not by duplication but by building upon what has already been found.

Of course only a station liberally provided with means could undertake so comprehensive a piece of work. Usually the investigator will need to compile the literature, if at all, only in a narrow field relating to the project on which he is working. Regard must be had for the fitness of things and for the proper proportions at all times. And if this work had stopped with the making of a compilation and critical digest it would be less worthy of an experiment station, but it formed a real part of a line of investigation in which Dr. Forbes has already made notable progress. The compilation is not an end in itself but its evident purpose is to clear the field as far as practicable, in order that the author and other investigators may know just the status of investigation in that field and so be better prepared to do thoroughly constructive work.

The review has given not only the results but the point of view and the method of attack which others have developed, and has furnished the basis for a critical examination and comparison to show the sources of error in investigation and in reasoning. Thus in a large way it takes advantage of the accumulated experience of many individual workers. By this means theories, views, and plans become crystallized and perfected.

A clear vision and purpose is the first great essential in investigation. The aim is what gives the work direction and largely determines its quality. A clear conception of the purpose of agricultural experiment and investigation will not be satisfied with a superficial attack or an aim which does not sight beyond what is already known, or what last year's results showed, or the empirical facts they established in a large way. Hence, the spirit of Dr. Forbes' review applies to our experimental work as a whole. This is its broader application.

We have reached a point in experiment station work where it is more pertinent than ever that more attention should be given to making the work progressive in aim if not always in actual attainment. We need to define clearly the end of real experiment and the beginning of demonstration. Each new piece of work which is undertaken, whether it be of experimental grade or research, has the advantage of accumulated experience and results out of which method, fact, and theory have developed. It is reasonable to expect, therefore, that it

should be better, more searching, and more conclusive than what has preceded it. How else can the expenditure of time and money be warranted, or the rightful ambitions of the investigator be satisfied?

Of course, we must find out whether what we know is true, but this usually implies more than simple repetition unless we are dealing with tradition. What we know is a product of reasoning from what has been definitely found out, and this at best is uncertain when our knowledge is in a transition stage, as much of it is which relates to agriculture. But the purpose of investigation is advancement, whether it be in extending the boundaries or in checking up what has been accepted as true. In either case it will not be characterized by duplication or repetition, but by a new point of view or method of attack.

The French scientist Berthelot once said, "If each of us adds something to the common domain in the field of science or art or morality, it is because a long series of generations have lived, worked, thought, and suffered before us." And an American scientist has enlarged upon this idea in defining the means by which knowledge grows: "Piece by piece must new truths be found and correlated. Each investigator must rest his work upon that of others. He must stand on the shoulders of the past if he is to look into the future. To know what has gone before is only possible where accumulated records are at hand."

Recognition of this has been the leading motive in preparing and issuing this journal, as a world review of new literature in agricultural science,—to enable the workers in that field to have access to the latest work and theory relating to their field. But research in agriculture is now reaching out so far into the basic sciences that no single abstract journal can meet all its needs, and other aids are necessary. This is the justification for spending money given for investigation in the purchase of scientific journals and books, and in their proper care.

As experimentation progresses we not only discover new phenomena, but in those we thought we knew unforeseen aspects reveal themselves. This is notably true in agricultural investigation. A thorough study of the experiments, even the simpler ones, if properly framed, reveals new facts or new means of advancement. Unless they receive adequate study or are builded on previous findings they become a round of mechanical routine, devoid of the prime essentials of productive experimentation.

It is sometimes advantageous to pause in doing and consider the nature of the end product. The experiment or the series of trials may meet all the accepted rules of procedure and follow the usual channels, but will they add another link in the chain of evidence or

simply more data of the same kind? Unless the former is the case the work will not be genuinely constructive; and at the present stage this may well be the test. If its aim is not constructive it is on doubtful ground; and if its method and attack are not such as to lead to advancement, it lacks the degree of efficiency which may now rightfully be expected.

It sometimes seems that even now the force of this is not fully appreciated, partly no doubt because the field and function of the experiment station is still confused with that of demonstration, and some of its workers from their relations or inclinations vacillate from one to the other without changing their viewpoint. The effects of this are seen particularly in the simpler experiments, which should aim at advancement and conclusion, but which often represent merely repetition and duplication, ending mainly in demonstration. These simpler experiments ought to mark a contribution, not merely to what their author knows but to what is generally known; and if they do not afford promise of such a result in their plan and method it is questionable whether money so much needed for productive work should continue to be assigned to them. Too often they are undertaken without a search of the available literature to learn what others have found, and hence they involve nothing new in conception or result. There should be a means of determining in advance the character and the reasonable prospects of each undertaking, whether it be a piece of investigation or a relatively simple field experiment.

Some of our experimental work has moved in circles. It has been done more from the demonstration standpoint than from that of acquiring information. The attitude and aim are not genuinely experimental but rather of convincing the farmer by example and improving his methods because the need of it is keenly felt. No one questions but it has had good effect, and it has often been done in response to state appropriations secured specifically for that kind of work, because the response to it was easier to arouse. But one effect of this has been to not only confuse the public but worst of all the staff of the station. It has put them in a wrong position as station men and their work in a false light as station work. It has often kept them from the opportunity for more advanced and progressive work, and has sometimes blinded them to the real character of what they were turning out.

Now that extension work is definitely organized and provided for, the purpose of the experiment station and its place in the institution should be made clear and maintained. Demonstration for the purpose of teaching and experimentation for the purpose of learning should not be confused, and each should be made in the highest degree effective.

RECENT WORK IN AGRICULTURAL SCIENCE.

AGRICULTURAL CHEMISTRY—AGROTECHNY.

Studies relating to the chemistry of milk and casein, L. L. VAN SLYKE and A. W. BOSWORTH (*New York State Sta. Tech. Bul.* 37 (1914), pp. 11; *Jour. Biol. Chem.*, 19 (1914), Nos. 1, pp. 67-71, 73-76; 3, pp. 397, 398).—This bulletin consists of three parts, as follows:

I. *The cause of acidity of fresh milk of cows and a method for the determination of acidity* (pp. 4-6).—"The acidity of fresh milk is due to the presence of acid phosphates. Titration of phosphoric acid with alkali, in the presence of calcium salts, results in hydrolysis of dicalcium phosphate formed during the titration, whereby free calcium hydroxid and phosphoric acid are first formed and then calcium hydroxid unites with more dicalcium phosphate to form insoluble tricalcium phosphate. As a result of these reactions more alkali is required to make a solution, containing calcium and phosphoric acid, neutral to phenolphthalein than is required in the absence of calcium. The calcium must be removed previous to titration by treatment of 100 cc. of milk with 2 cc. of saturated solution of neutral potassium oxalate^a."

II. *The phosphorus content of casein* (pp. 7-10).—"The amount of phosphorus in casein has been commonly given as about 0.85 per cent. By treating a solution of casein in dilute NH_4OH with ammonium oxalate and an excess of NH_4OH and letting stand 12 hours the phosphorus content is reduced to about 0.7 per cent. This lower percentage can not be explained as being due to hydrolysis of casein and splitting off of phosphorus. While some of the casein is hydrolyzed, this portion does not enter into the final preparation and does not affect its composition, because the hydrolyzed portion is not precipitated by acetic acid while the unhydrolyzed part is. The higher figure ordinarily given is due to the presence of inorganic phosphorus (dicalcium phosphate) carried from the milk into the precipitated casein and not entirely removed under the usual conditions of preparation. The lower figure corresponds very closely to two atoms of phosphorus (0.698 per cent) in the casein molecule. Analyses of various preparations of casein containing varying amounts of ash show a general correspondence between the ash and phosphorus content."

III. *The action of rennin on casein* (pp. 10, 11).—"This study was made for the purpose of determining whether the change from casein to paracasein is accompanied by cleavage of any of the elements contained in the casein molecule. The use of an excess of ammonia commented on by Harden and McCallum (see p. 607) was not found to result in the loss of phosphorus due to cleavage of the casein molecule. "The similarity between the composition of casein and paracasein, and the fact that casein has been shown to have a molecular weight of 8,888+ and a valency of 8, while paracasein has been shown to have a molecular weight of 4,444+ and a valency of 4, seems to be

^a Amer. Jour. Physiol., 9 (1913), No. 5, pp. 265-278.

evidence enough for concluding that the transformation of casein into paracasein is a process of hydrolytic splitting, one molecule of casein yielding two molecules of paracasein, and that this splitting of casein is not accompanied by a cleavage of any of the elements contained in the original casein molecule [E. S. R., 29, p. 805]."

Condition of casein and salts in milk, L. L. VAN SLYKE and A. W. BOSWORTH (*New York State Sta. Tech. Bul.* 39 (1914), pp. 3-17; *Jour. Biol. Chem.*, 20 (1915), No. 2, pp. 135-152).—"Milk contains two general classes of compounds, those in true solution and those in suspension, or insoluble. These two portions can be separated for study by filtering the milk through a porous earthenware filter like the Pasteur-Chamberland filtering tube.

"Serum prepared from fresh milk is yellow with a faint greenish tinge and slight opalescence. The following constituents of milk are wholly in solution in the milk serum: Sugar, citric acid, potassium, sodium, and chlorine. The following are partly in solution and partly in suspension: Albumin, inorganic phosphates, calcium, magnesium. Albumin in fresh milk appears to be adsorbed to a considerable extent by casein and therefore only a part of it appears in the serum. In serum from sour milk and milk to which formaldehyde has been added, nearly all of the albumin appears in the serum.

"The insoluble portion of milk separated by filtration through Pasteur-Chamberland filtering tubes is grayish to greenish white in color, of a glistening, slime-like appearance, and of gelatinous consistency. When shaken with water it goes into suspension, forming a mixture having the opaque, white appearance of milk. Such a suspension is neutral to phenolphthalein. When purified, the insoluble portion consists of neutral caseinate (casein Ca_4) and neutral dicalcium phosphate (CaHPO_4). The casein and dicalcium phosphate are not in combination, as shown by a study of 16 samples of milk from 13 individual cows, and also by a study of the deposit or 'separator slime' formed by whirling milk in a cream separator. By treating fresh milk with formaldehyde and whirling in a centrifugal machine under specified conditions, it is possible to effect a nearly complete separation of phosphates from casein.

"Both fresh milk and the serum from fresh milk show a slight acid reaction to phenolphthalein, but are strongly alkaline to methyl orange, indicating that acidity is due, in part at least, to acid phosphates. In eight samples of fresh milk the acidity of the milk and of the milk serum was determined after treatment with neutral potassium oxalate. The results show that the acidity of the whole milk is the same as that of the serum, and that, therefore, the constituents of the serum are responsible for the acidity of the milk. There is every reason to believe that the phosphates of the serum cause the observed acidity."

In the study the Briggs apparatus for filtration (E. S. R., 14, p. 127) was employed. See also notes by Schreiner and Failyer and by Rupp (E. S. R., 17, p. 831; 29, p. 109).

On the basis of the data presented, taken together with many other analytical data worked out by the authors, the following composition of milk is suggested: "Total solids, 12.901 per cent: Fat 3.90, milk-sugar 4.90, proteins combined with calcium 3.20, dicalcium phosphate (CaHPO_4) 0.175, calcium chloride (CaCl_2) 0.119, monomagnesium phosphate ($\text{MgH}_2\text{P}_2\text{O}_8$) 0.103, sodium citrate ($\text{Na}_3\text{C}_6\text{H}_5\text{O}_7$) 0.222, potassium citrate ($\text{K}_3\text{C}_6\text{H}_5\text{O}_7$) 0.052, dipotassium phosphate (K_2HPO_4) 0.230." The amounts are based on milk of average composition.

On the action of coagulating enzymes on caseinogen, A. HARDEN and A. B. MACALLUM (*Biochem. Jour.*, 8 (1914), No. 1, pp. 90-99).—"The conversion of caseinogen into casein by enzym action is accompanied by the cleavage of

nitrogen, phosphorus, and calcium. Rennin action produces no soluble nitrogen or phosphorus. Trypsin splits off both soluble nitrogen and phosphorus, while the Withania enzyme also produces soluble nitrogen and phosphorus but in smaller absolute quantities. The cleavage products are specific for each enzyme and it is to this difference of enzyme action that the variation in behavior of the resulting casein is to be ascribed. The precipitation of calcium caseinate by soluble calcium salts is not due to any chemical combination with these. The caseinogen once exposed to enzyme action and redispersed can not be rendered more precipitable by renewed enzyme action. If the enzyme be sufficiently concentrated, precipitates are obtained without the addition of calcium salts and the same thing occurs with more dilute enzyme solutions when the temperature is raised above 45°."

The importance of using an appropriate method for preparing casein is pointed out. "In preparations for milk the use of sodium hydrate was avoided so as to escape the possibility of hydrolyzing the protein. Van Slyke and Bosworth have used ammonia in the final stages of their method [E. S. R., 29, p. 9], allowing it to remain in contact with the caseinogen overnight. Their preparations have a very low ash content and the phosphorus content is the lowest yet recorded. This is due possibly to removal of phosphorus by the action of the alkali."

Caseinogen and casein, A. GEAKE (*Biochem. Jour.*, 8 (1914), No. 1, pp. 30-37).—The object of this investigation was to determine the difference, if any, between caseinogen (casein) and casein (paracasein) in elementary composition and in the Hausmann numbers.^a See also a note by Osborne and Harris (E. S. R., 15, p. 221).

A slight modification of the Carius method was used for the sulphur determination. The results obtained for sulphur were higher than those which have been previously obtained for caseinogen. "The sulphur contents of caseinogen and casein appear to be identical, but casein apparently contains more phosphorus than caseinogen. The difference is, however, not sufficient to warrant the supposition that the two proteins are chemically different."

The figures for the Hausmann numbers were also too low to establish any definite differences.

The detection of potassium with tartaric acid, L. W. WINKLER (*Ztschr. Angew. Chem.*, 26 (1913), No. 29, *Aufsatzteil*, p. 208).—Potassium bitartrate has the property of forming hypersaturated solutions, so that the use of a solution of tartaric acid as a reagent for detecting potassium often fails. If, however, the tartaric acid is used in powdered form and the solution is not too dilute, the characteristic precipitate is quickly obtained. The procedure recommended is as follows:

To 10 cc. of an approximately 5 per cent neutral solution of the substance under examination is added 0.5 gm. of crystalline powdered acetate, then approximately 0.5 gm. of powdered tartaric acid, and the mixture is shaken thoroughly. If no potassium (or ammonium, rubidium, or caesium) is present the solution remains perfectly clear. If the solution contains 0.2 per cent or more of the potassium ion the reaction occurs only after one to two minutes. It is advisable to conduct a control test with a solution of sodium chlorid or distilled water. The reaction can be employed for potassium chlorid, bromid, iodid, nitrate, chlorate, sulphate, etc., and the organic compounds of potassium, with the exception of tartar emetic. With alum the reaction is less sensitive.

^a Hoppe-Seyler's *Ztschr. Physiol. Chem.*, 27 (1899), No. 1-2, pp. 95-108; 29 (1900), No. 2, pp. 136-145.

Detecting potassium with tartaric acid, H. RECKLEBEN (*Ztschr. Angew. Chem.*, 26 (1913), No. 49, *Aufsatzteil*, pp. 375, 376).—In discussing the method proposed by Winkler (see above) it is pointed out that when the concentrations are not properly controlled the potassium hydrogen tartrate is dissolved or the tartaric acid remains undissolved despite the fact that the potassium ion may be absent. The test also loses its force when the necessity exists for making a blind test, as proposed by Winkler, with distilled water or a sodium chlorid solution. For a number of years the following procedure has been used, especially for beginners in the laboratory:

To the solution, which should not be too dilute, is added a fairly concentrated solution of sodium bitartrate. If it is desired to employ tartaric acid it should be utilized as a solution of tartaric acid containing sodium acetate, and with the precaution that the latter is not employed in a large excess. If no precipitate results on gently rubbing the walls of the vessel with a glass rod, the glass rod with its adhering fluid is put on a watch glass holding a few drops of a 10 per cent solution of a potassium salt, and when crystallization has set in the glass rod with its adhering fluid is replaced in the solution to be tested.

The author believes this method is better than the one proposed by Winkler.

The micro-chemical detection and distribution of aluminum in the plant kingdom, E. KRATZMANN (*Sitzber. K. Akad. Wiss. [Vienna], Math. Naturw. Kl.*, 122 (1913), I, No. 2, pp. 311–336, figs. 6).—The methods for the micro-chemical detection of aluminum in plant tissues recorded in the literature were studied and Cs_2SO_4 was the only reagent found satisfactory for detecting it as $\text{Al}_2(\text{SO}_4)_3 \cdot \text{Cs}_2\text{SO}_4$. The sensitiveness was 0.3 microgram. A modification of the method was necessary, however, in order to be able to work more rapidly.

One hundred and thirty plants representing various families were examined for the presence of aluminum. The results indicate that aluminum is widely distributed in the plant kingdom and some plants might justly be termed "aluminum plants." Many cryptogams show a marked accumulation of alumina in the sporophylls, and the blossoms of angiosperms contain more aluminum than the other parts of the plant.

The clay bodies described by Radlkofer could be found only in a few varieties of symplocos. It has not been definitely settled, however, that these bodies consist of clay only, and they probably contain silica. When aluminum is present with silica it is hard to detect, even with the Thénard blue test.

Some plants possess a specific selective affinity for aluminum.

The determination of the lime requirements of the soil, H. B. HUTCHINSON and K. MACLENNAN (*Chem. News*, 110 (1914), No. 2854, pp. 61, 62).—The various methods heretofore proposed for determining the lime requirements of soils, including those of Loew and Jones, are critically discussed. Veitch's method (*E. S. R.*, 14, p. 418) was found to give results closely corresponding to the actual but it is claimed to be a very tedious process and difficult of adoption on a large scale. "It appeared, therefore, that a closer investigation of the action of certain carbonates on the soil might give a measure of prevailing acidity, and would possibly conform more closely to natural conditions than some of the compounds hitherto employed."

As preliminary work with sodium carbonate and bicarbonate gave unsatisfactory results, the use of calcium bicarbonate was proposed. The solution is prepared "by passing a current of carbon dioxid into a suspension of calcium carbonate in distilled water, or by means of a 'Sparklet' or refillable soda water syphon, where bulbs of compressed carbon dioxid are used. The latter method is the more convenient, and permits of the preparation of a saturated solution within quite a short time. A large excess of carbonate must be used

in order to provide an abundance of small particles which readily pass into solution; the contents of the syphon may be diluted with one-third its volume of distilled water before filtering, and this will result in the formation of a solution of approximately fiftieth-normal strength.

"For a determination of acidity, or lime requirement, 10 to 20 gm. of the soil is placed in a bottle of 500 to 1,000 cc. capacity together with 200 to 300 cc. of the approximately fiftieth-normal solution of calcium bicarbonate, and the air in the bottle is displaced by a current of carbon dioxide in order to insure against possible precipitation of the calcium carbonate during the period of determination. The bottle is then placed in a shaking machine for three hours, after which time it is opened, the liquid is filtered, and a portion of the filtrate equal to half of the original amount of bicarbonate solution is titrated against tenth-normal acid, using methyl orange as indicator. The difference between this final titration and that of the initial solution represents the amount of calcium carbonate absorbed, each cubic centimeter of tenth-normal acid being equal to 5 mg. calcium carbonate.

"This method has been tested on a number of different soils, the behavior of which has been ascertained bacteriologically and chemically in the laboratory. A few of these results are summarized, in which the production of ammonia and nitrates and plant growth in untreated and limed soils is given. . . .

"In addition to its value for practical agricultural work, the method will possibly be of use in various ecological problems, where the relations between plant and soil require more accurate determination."

Method of determining the lime requirement of soils, C. H. JONES (*Amer. Fert.*, 39 (1913), No. 11, pp. 28, 29).—"Take 5.6 gm. soil, add 0.5 gm. calcium acetate (tested reagent), place in a 3-in. mortar, and mix with pestle. Add sufficient water (room temperature) to make a fairly stiff paste. Pestle for 20 seconds, add 30 cc. water, and continue mixing for 30 seconds. Wash into a 200-cc. flask, and keep bulk down to about 160 cc. Let stand, with occasional shaking, for 15 minutes. Make up to bulk of 200 cc., mix, and filter through a dry filter. Discard first 10 to 15 cc., which may be cloudy. Titrate 100 cc. of the clear filtrate, using phenolphthalein as an indicator with decinormal NaOH. This reading multiplied by 2 gives the cubic centimeters of decinormal alkali required to neutralize the acetic acid in 200 cc. of the solution. This figure times the factor 1.8 times 1,000 equals the pounds of lime (CaO) required per 2,000,000 lbs. of soil." The calculation may be shortened by multiplying the number of cubic centimeters of decinormal sodium hydroxid used by 3,600.

"The factor 1.8 is a tentative one only, it having been secured on a relatively small number of samples representing Rhode Island, Massachusetts, Vermont, and New Jersey soils. The method is extremely rapid, one man easily making 50 determinations in a day."

See also a previous note, Loew (*E. S. R.*, 29, p. 815).

A new method for the determination of soil acidity, E. TRUOG (*Science*, n. ser., 40 (1914), No. 1024, pp. 246-248).—One of the most serious drawbacks in the study of soil acidity is the lack of a suitable qualitative and quantitative method for its determination. While the litmus paper test when performed properly is a fairly satisfactory qualitative test its reaction with carbonic acid is confusing. With the view of securing a more reliable method the zinc sulphid test was devised, which depends upon the evolution of hydrogen sulphid when acid soils are boiled with zinc sulphid and water.

"Ten gm. of soil is placed in a 300 cc. Erlenmeyer flask and to this is added 1 gm. calcium chlorid, 0.1 gm. of zinc sulphid, and 100 cc. water. This is thoroughly shaken and then heated over a flame. After the contents have boiled one

minute, a strip of moistened lead acetate paper is placed over the mouth of the flask and the boiling continued two minutes more, when the paper is removed. If the soil is acid the paper will be darkened on the underside in proportion to the degree of acidity. If it is nonacid, no darkening will occur if the test has been performed as just outlined."

Calcium chlorid, which is added for the purpose of making the test much more sensitive, reacts with the comparatively insoluble soil acids and forms a small amount of hydrochloric acid which readily liberates the hydrogen sulphid from the zinc sulphid. The test is said to detect much smaller amounts of soil acids than the litmus paper test. "The test has been applied to a considerable number of soils and also other materials of known reaction and as yet not a single objection to the test has arisen. As a quantitative method, an effort is being made to measure the degree of acidity by titrating with standard iodine solution the hydrogen sulphid which a soil will liberate. Whether this will work with all soils has as yet not been determined. By using this test for the end point in the Veitch lime water method for acidity or lime requirements, the present Veitch method is considerably shortened and made far more accurate."

Inasmuch as the test can be made approximately quantitative and still require only very simple apparatus and very little time (10 to 15 minutes), it makes a valuable field procedure. "The principle of this quantitative method depends upon the fact that for any particular class of soils the degree of acidity is closely proportional to the intensity of color produced on the paper when the test is conducted as previously outlined. The color on the test paper needs only to be compared to a standard color scale and from an accompanying table the degree of acidity or lime requirements is read off directly. This standard color scale is now being prepared and checked up with standard soil acids made by new methods."

A shaker for the mechanical analysis of soil, F. WARD (*Jour. Indus. and Engin. Chem.*, 6 (1914), No. 2, pp. 147, 148, fig. 1).—A description of a homemade device.

"The writer believes that his method is better than the one used by the Bureau of Soils in two respects. In the first place the machine is simple and inexpensive. A greater advantage is the saving of time. Clean separations can be effected in three hours, and in some cases two hours; this is a saving of at least four hours over the Bureau method. If the quantity of the water used in the bottles is reduced one-half, a clean separation results in much less than three hours, but there is a tendency for the grains to suffer some abrasion."

A shaker for the mechanical analysis of soils, C. C. FLETCHER (*Jour. Indus. and Engin. Chem.*, 6 (1914), No. 6, pp. 517, 518).—It is pointed out that although the machine mentioned in the abstract above is simple and inexpensive it carries only 16 bottles while that of the Bureau of Soils holds 48. It must also be run at a fixed speed to be efficient. The length of time required by the Bureau of Soils apparatus is not so great as stated, since a majority of soils, especially sandy soils, do not need seven hours' shaking. "The length of time of shaking does not result in any loss of time to the operator, as the analyst merely keeps 48 soils shaking on the machine all the time and can not complete the analyses rapidly enough with a force of three men to keep the machine cleared of samples ready for analysis. If more samples should be required, all that is necessary is to run the machine during the night, and thus the capacity of the machine would be doubled."

New investigations on the determination of citric acid-soluble phosphoric acid in Thomas slag powder, M. POPP (*Chem. Ztg.*, 37 (1913), No. 109, pp. 1085–1087, fig. 1).—In this article the Popp method (*E. S. R.*, 30, p. 809) is

described in full, and the results obtained with the method and other methods and slags of widely varying composition are given. The figures given by the Popp method compared well with those by the other methods.

Some work conducted at other experiment stations with the new iron citrate method and other methods (old iron citrate, hydrochloric acid, Naumann, and von Lorenz methods) is also reported. The results in general confirmed the author's conclusions in regard to injurious silicic acid. The new iron citrate method, when compared with the Naumann and hydrochloric acid methods, seemed to give the best result. The von Lorenz method on the average (100 analyses) gave 0.28 per cent less phosphoric acid than the Naumann method, and 0.25 per cent less than the hydrochloric acid method.

A field method for determining dissolved oxygen in water, J. MILLER (*Jour. Soc. Chem. Indus.*, 33 (1914), No. 4, pp. 185, 186).—The method adopted is as follows:

"To 50 cc. of the water contained in a 100 cc. Nessler cylinder is added 5 cc. of alkaline tartrate such as is used for Fehling's solution and one drop of phenosafranin solution (1 in 2,000 of water), then from a 10 cc. graduated pipette a solution of ferrous sulphate (0.22 gm. of pure FeSO_4 and 1 cc. of concentrated sulphuric acid in 100 cc.) is run in just below the surface of the liquid, stirring gently with the pipette until the color is discharged, looking through the cylinder horizontally. The ferrous sulphate is added 1 cc. at a time until the color begins to fade, then in additions of 0.5 cc. to the end. There is a slight coloration at the surface of the liquid, but if the stirring is not too vigorous this does not interfere. The outlet hole of the pipette should not be more than 1 mm. in diameter to minimize diffusion.

"The pipette reading gives the cubic centimeters of oxygen per liter. Theoretically 1 cc. ferrous sulphate of above strength does not equal 1 cc. oxygen per liter working on 50 cc. of sample (0.25 per cent FeSO_4 is theoretical strength), but under the conditions stated I have found that the above strength gives correct results.

"Each experimenter should standardize his ferrous sulphate against water of known oxygen content, say distilled water shaken with air until saturated, taking the temperature and referring to Roscoe and Lumt's table (*Sutton's Volumetric Analysis*, page 260) for the amount of dissolved oxygen present."

The results obtained compared well with those given by the Winkler method.

The detection of extracted paprika, G. HEUSER and C. HASSLER (*Ztschr. Untersuch. Nahr. u. Genussmit.*, 27 (1914), No. 1-3, pp. 201-209).—For determining whether paprika has been extracted the iodine number is considered satisfactory on account of the ease and rapidity with which it can be determined. The ether extract is, however, a better constant for judging paprika than the alcohol extract. For simplifying and shortening the time necessary for extraction a modification of the Rösse-Gottlieb method is suggested.

A field test for lime-sulphur dipping baths, R. M. CHAPIN (*U. S. Dept. Agr. Bul.* 163 (1915), pp. 7, fig. 1).—The object of this paper is to describe a portable testing outfit devised and employed by the Bureau of Animal Industry for determining the strength of lime-sulphur dipping baths used in the official dipping under regulations now in force. "This method, however, is intended only for field use; it can not replace in the laboratory the more accurate methods of analysis approved by the Association of Official Agricultural Chemists. . . .

"The test here described employs the well-known reaction between soluble sulphids and iodine in neutral solution, whereby sulphur is precipitated and a metallic iodide is formed. It therefore directly estimates, not sulphur, but the

metal—in this case calcium—combined with sulphur in the form of sulphid or polysulphid. . . . Briefly, the method of test involves the addition of standard iodine solution to a measured quantity of bath until the resulting liquid no longer gives color with a dilute alkaline solution of sodium nitro-prussid, showing that calcium polysulphid has been entirely decomposed. The amount of iodine added to reach this point is then a measure of the amount of 'sulphid sulphur' in the bath."

The outfit used is illustrated and tables showing quantities of concentrated dip to be added to each 100 gal. of bath to restore it to the standard strength (1.5 to 2 per cent sulphid sulphur) are given.

About some seeds which have rarely been examined and their oils, A. DIEDRICHS (*Ztschr. Untersuch. Nahr. u. Genussmtl.*, 27 (1914), No. 1-3, pp. 132-141).—This gives data in regard to the China orange, lemon, India butter tree (*Bassia butyracea*), *Stillingia*, and *Calotropis* or akoon (*C. gigantea*).

Agricultural alcohol: Studies of its manufacture in Germany, E. KREMERS (*U. S. Dept. Agr. Bul.* 182 (1915), pp. 35).—These data collected in Germany deal with the topic under the following headings: History; the economic situation; mash-capacity taxes, 1820 and 1868; taxes on the finished products, 1887; tax refunds on industrial alcohol, 1879 and 1887; increase in technical applications of alcohol; distillation of tax of 1895, and bonus on industrial alcohol; increase in potato culture; cooperation in marketing; organization of the central association; success of the central association; voluntary regulation of production; the potato the principal source of alcohol; the distillery as a factor on the market; distilleries on the larger estates and domains; distilleries on small farms; cooperative distilleries; and a report of visits to agricultural distilleries at Dahlem, Dahlewitz, Dominium Neuguth-Heinzenburg, Treben, Weihenstephan, and Perlach.

Osage orange.—Its value as a commercial dyestuff, F. W. KRESSMANN (*Jour. Indus. and Engin. Chem.*, 6 (1914), No. 6, pp. 462-464).—This is a study of the utilization of Osage orange mill waste. As a rule the trunk of an Osage orange tree is small in size, misshapen, and generally defective as a saw log, "and, although because of the valuable properties of the wood (for wagon felloes especially) closer utilization will scarcely be found in the use of any other wood, comparatively large amounts of waste are produced annually.

"Osage orange has long been used in Texas in a small way as a dyewood. The roots, bark, and wood are chipped and boiled with water and a more or less permanent yellow is obtained from the extract." As a result of the investigation it was found that the quality and quantity of the dyestuff present is almost identical with that of fustic.

"Osage orange may be employed as a dyewood in all cases where fustic wood is used at present. The yellows produced by direct dyeing or by aluminum and tin mordants are too fugitive to be of commercial value. But the orange-yellows, old gold, deep tan, olive, and chocolate shades obtained with chromium and iron mordants are equal to, if not better than, those obtained with fustic and are of sufficient fastness to be of commercial value.

"A domestic source of a yellow dyewood has been found that can advantageously replace a foreign material used at present. The mill waste alone from the present manufacture of osage orange amounts to over 25,000 tons annually; and if this waste could be set down in the East for \$10 or \$12 per ton it is believed that it could compete successfully with fustic, both from cost of production and quality of color produced on dyeing."

METEOROLOGY.

Monthly Weather Review (*Mo. Weather Rev.*, 42 (1914), Nos. 9, pp. 519-559, pls. 8, figs. 8; 10, pp. 561-608, pls. 24, figs. 6).—In addition to notes on weather forecasts for September and October, 1914, river and flood observations, lists of additions to the Weather Bureau library and of recent papers on meteorology, notes from the Weather Bureau library, the weather of these months, a condensed climatological summary, and climatological tables and charts, these numbers contain the following articles:

No. 9.—Solar Radiation Intensities at Mount Weather, Va., During July, August, and September, 1914, by H. H. Kimball; Notes on Observing the Zodiacal Light, by M. Hall; Shooting Stars Reveal a Higher Atmosphere; Influence of Terrestrial Rotation on the Condition of the Atmosphere and Ocean (illus.), by J. W. Sandström; Daily March of the Meteorological Elements in the Panama Canal Zone, by J. von Hann; The Function of the Atmosphere in [Wireless] Transmission (illus.), by J. Erskine-Murray; Rainfall after Battle, by H. M. Chittenden; The Hourly Frequency of Precipitation at New Orleans, La. (illus.), by E. D. Coberly; Forecast Distribution (illus.), by G. W. Smith; and Heavy Rainstorm at Kansas City, Mo., by P. Connor.

No. 10.—Frost Protection (illus.), by W. J. Humphreys; Utilization of Frost Warnings in the Citrus Region near Los Angeles, Cal. (illus.), by F. A. Carpenter; Frost and Frost Prevention, by J. W. Garthwaite; Air Drainage in the Vicinity of the Corona District, Cal. (illus.), by F. A. Carpenter and J. W. Garthwaite; Frost Warnings and Orchard Heating in Ohio (illus.), by J. W. Smith; Air Drainage Explained, by C. F. Marvin; Protection Against Frost in Georgia, by C. F. von Herrmann; Protection from Frost in Utah, by A. H. Thiessen; Notes on Frost Protection in the Vicinity of Knoxville, Tenn., by J. F. Voorhees; Frost Forecasts and Protection in Oregon, Washington, and Idaho, by E. A. Beals; Frost and Frost Protection in Florida, by A. J. Mitchell; Frost Protection in Arizona, by R. B. Briggs; Frosts and Frost Protection in Texas, by M. Sprague; and Frost Protection by Irrigation in Southern Texas, by J. L. Cline.

Climatological data for the United States by sections (*U. S. Dept. Agr., Weather Bur. Climat. Data*, 1 (1914), Nos. 11, pp. 224, pls. 2, figs. 8; 12, pp. 236, pls. 2, figs. 7).—These numbers contain brief summaries and detailed tabular statements of climatological data for each State for November and December, 1914, respectively.

Meteorological observations at the Massachusetts Agricultural Experiment Station, J. E. OSTRANDER and R. E. McLAIN (*Massachusetts Sta. Met. Buls.* 313, 314 (1915), pp. 4 each).—Summaries of observations at Amherst, Mass., on pressure, temperature, humidity, precipitation, wind, sunshine, cloudiness, and casual phenomena during January and February, 1915, are presented. The data are briefly discussed in general notes on the weather of each month.

[**Meteorological observations**], D. A. SEELEY (*Ann. Rpt. Sec. Bd. Agr. Mich.*, 53 (1914), pp. 185-198).—Daily and monthly summaries of temperature (maximum, minimum, and mean), precipitation, cloudiness, and sunshine, and monthly summaries of pressure (maximum, minimum, and mean), wind movement, and miscellaneous phenomena (frost, hail, thunderstorms, fog, auroras, and halos) are given for the year ended June 30, 1914.

Meteorological records for 1913 (*New York State Sta. Rpt.* 1913, pp. 789-801).—Tables are given showing tridaily readings at Geneva, N. Y., of standard air thermometers for each month of the year; daily readings of maximum and minimum thermometers at 5 p. m. for each month of the year; a monthly sum-

mary of maximum, minimum, and standard thermometer readings; monthly and yearly maximum and minimum temperatures from 1883 to 1913, inclusive; average monthly and yearly temperatures since 1882; and rainfall by months since 1882.

Response to rainfall in India, L. O. PACKARD (*Bul. Amer. Geogr. Soc.*, 47 (1915), No. 2, pp. 81-99, figs. 3).—This article discusses the factors controlling distribution and variation of rainfall in India and its relation to irrigation, crop production, and man's welfare. The relation to rainfall variation of topography, extra-tropical cyclones, summer monsoons with their accompanying cyclones, and proximity to the sea with long-continued sea winds is briefly explained.

Among crops which require heavy rainfall or irrigation are named rice, jute, tea, and coffee. Sugar cane is also grown in the wet areas. "Jute, tea, and coffee differ from sugar and rice in that their areas are not extended by irrigation but are limited to those regions in which water is supplied wholly by rainfall. . . . Crops requiring less water are wheat, millets, pulses, and cotton. Wheat and cotton are injured by heavy rains, especially during the later stages of growth. For this reason cotton, although a summer crop, is limited to those provinces having a comparatively light rainfall, as in parts of northern India and in the northern and central parts of peninsular India. . . .

"Two crops a year are raised in many parts of India, although in many cases the poor soils, combined with primitive methods of cultivation, do not permit two crops to be raised upon the same land in a given year." However, "in most parts of the country the rainfall, in favorable seasons, is well adapted for two crops per year. . . .

"For the reason that rainfall is always scanty in certain parts of India, and that nearly all parts are subject to seasons of light rain, or of unsatisfactory distribution of rainfall, irrigation systems have been developed throughout the country. The regions receiving heavy rainfall, and consequently those in which chances of failure are remote, are Bengal and Assam and the strip of territory west of the Western Ghats."

Irrigation is secured by means of canals and wells, the latter supplying water for only small areas (1 to 20 acres).

Nitrogen compounds in rain and snow, F. T. SHUTT (*Proc. and Trans. Roy. Soc. Canada*, 3. ser., 8 (1914), Sect. III, pp. 83-87).—In continuation of previous reports (*E. S. R.*, 32, p. 419), this article records the results of studies on this subject during the seven years ended February 28, 1914.

The average amount of nitrogen brought down by the precipitation during this period is shown to have been 6.182 lbs. per acre. Approximately 70 per cent of this was in the form of free and organic ammonia and 30 per cent nitrates. Approximately two-thirds of the total precipitation was rain and this supplied very nearly 85 per cent of the nitrogen. The observations show that the rain is decidedly and invariably richer than snow in nitrogen compounds.

It was observed that the prevalence of bush or forest fires increased the ammonia content of the precipitation to a marked extent. A light rainfall after a period of hot, dry weather was especially rich in nitrogen compounds. Rain during thunderstorms was always found to be rich in nitrogen, but this is attributed more to an increased amount of dust in the air than to nitrates produced by electric discharges.

In these studies every precipitation of rain or snow that was sufficient for analysis was chemically examined, it having been observed that results from composite samples representing the rain of a week or a month were not reliable. "The collection of the samples of rain was made on a leaden tray or basin,

placed about 20 ft. from the ground, which for some distance around is lawn and shrubbery. It is approximately 60 by 30 in. The water as it falls is conducted from the bottom of the basin by means of a glass tube into a glass jar, from which the sample for analysis is taken at the end of each rainfall."

Nitrogen and chlorin in rain and snow, W. K. KNOX (*Chem. News*, 111 (1915), No. 2880, pp. 61, 62).—In continuation of previous studies by Wiesner (E. S. R., 30, p. 815) the author reports determinations of the nitrogen and chlorin content of 36 samples of rain and 7 of snow collected at Mount Vernon, Iowa, from October 4, 1913, to June 12, 1914. The snowfall during the period amounted to 11.5 in., equivalent to 0.95 in. of rain. The rainfall was 17.75 in.

It is estimated from the determinations that the total precipitation during the period named carried down to the soil 36.85 lbs. of chlorin per acre, 1.54 lbs. of nitrates, 0.01 lb. of nitrite, 3.69 lbs. of free ammonia, 2.79 lbs. of albuminoid ammonia, and 0.13 lb. of sulphate.

SOILS—FERTILIZERS.

Soil survey of Goodhue County, Minnesota, W. G. SMITH ET AL. (*U. S. Dept. Agr., Advance Sheets Field Operations Bur. Soils*, 1913, pp. 34, fig. 1, map 1).—This survey, issued February 3, 1915, deals with an area of 490,880 acres in southeastern Minnesota, consisting of rolling to hilly upland which drains eastward into the Mississippi River. The soils of the area consist mainly of dark brown to black silt loams with relatively small areas of stony gravelly soils, and are grouped naturally into upland, high river terraces, and overflow bottom land. Twenty-five soil types of ten series and two miscellaneous types are mapped. The Knox silt loam, covering 43 per cent of the area, is the most important and extensive upland type, the Waukesha silty clay loam is the most extensive river terrace type, and the Wabash soils are the most important of the bottom land types. It is stated that an excessive acreage in small grain and too little in clover has materially reduced the producing power of the naturally strong soils of the county and that a reorganized cropping practice is necessary.

The soils of Pennsylvania, C. F. SHAW (*Pennsylvania Sta. Bul.* 132 (1914), pp. 209–242, fig. 1).—This bulletin summarizes the results of a reconnaissance survey of the soils of Pennsylvania made by the Bureau of Soils of this Department in cooperation with the Pennsylvania State College.

The State is naturally divided into three physiographic sections. The first lies east and south of Blue Mountain and has a generally rolling to hilly topography. The second lies between Blue Mountain and the Allegheny escarpment and consists of a succession of mountain ridges and valleys. The third lies west and north of the Allegheny escarpment and has a topography varying from rolling to hilly and mountainous.

Seventy-four per cent of the soils of the State are residual in origin, 22 per cent are glacial, and 4 per cent are alluvial and lacustrine. The soils are classed in seven provinces and forty-seven series. The Dekalb series is the most extensive, covering 43.5 per cent of the State, and the Volusia series is second, covering 19.4 per cent of the area. Each soil series is briefly discussed with reference to extent, distribution, general characteristics, and crop adaptabilities.

Soil survey of Orangeburg County, South Carolina, J. H. AGEE ET AL. (*U. S. Dept. Agr., Advance Sheets Field Operations Bur. Soils*, 1913, pp. 39, fig. 1, map 1).—This survey, issued February 16, 1915, deals with an area of 702,720 acres in south-central South Carolina, the topography of which ranges from

level to gently rolling. Most of the lands are in the Coastal Plains province, a small part in River Hood Plain province, and there is a gradation from well-drained rolling lands to poorly drained swampy flats. The southern and southeastern parts of the county are very poorly drained. The soils of the county are grouped according to origin as sedimentary, alluvial, and colluvial, the first greatly predominating. Twenty-seven types comprising eleven series and two miscellaneous types are mapped and described, of which the Norfolk series is the most extensive (over half of the total area). The Orangeburg sandy loam covering about 4 per cent of the total area "is one of the strongest soils in the county and most of it is under cultivation." About half the area of the county is under cultivation, cotton being the most important crop. Commercial fertilizers are used extensively but rotation of crops is not generally practiced although followed on many farms. "The mellow character of the soils, coupled with the favorable surface features, invites the use of all kinds of labor-saving machinery."

Soil survey of Washington County, Texas, A. H. MEYER ET AL. (*U. S. Dept. Agr., Advance Sheets Field Operations Bur. Soils, 1913, pp. 31, fig. 1, map 1*).—This survey, issued January 26, 1915, deals with an area of 392,320 acres in southeastern Texas, the topography of which varies from level to rolling. Drainage is said to be generally good. The soils of the area are of residual and alluvial origin and range from a heavy waxy clay through a loam and sandy loam to a loamy sand and fine sand. Five series, comprising eleven types, are mapped. The Houston types cover about two-thirds of the county and of these the black clay is the most extensive. It is stated that, although the agriculture of the county is generally prosperous, little attention is given to the adaptation of soils to crops and no system of crop rotation is followed.

Better crop adaptations for the different types of soil are suggested. Farm manure is generally used with very beneficial results. "There is a general need for more thorough tillage, deeper plowing, and the conservation of soil moisture."

Soil survey of Boone County, West Virginia, W. J. LATIMER (*U. S. Dept. Agr., Advance Sheets Field Operations Bur. Soils, 1913, pp. 26, fig. 1, map 1*).—This survey, made in cooperation with the West Virginia Geological Survey, was issued February 10, 1915. It deals with an area of 323,840 acres in southwestern West Virginia, the topography of which is rough and broken. Only about 25 per cent of the area is cleared. The northeastern part is drained by the Coal River and the remainder mainly by the Little Coal River and its tributaries. The soils of the county are grouped as upland or residual soils, terrace or second bottom soils, and first bottom or overflow land. Eleven soil types, comprising four series, and two miscellaneous types are mapped, of which the Dekalb stony silt loam is the most extensive, covering 85.2 per cent of the county. The principal crops grown are corn, oats, hay, potatoes, and vegetables. Very little commercial fertilizer is used and no general system of crop rotation is practiced in the county.

The properties of soil grains and the plasticity of soils, A. ATTERBERG (*Kolloidchem. Beihefte, 6 (1914), No. 2-3, pp. 55-89, figs. 3; abs. in Jour. Chem. Soc. [London], 106 (1914), No. 623, I, p. 1120*).—The author takes the position that mechanical analysis alone is not adequate for distinguishing the properties of different classes of soils. It is deemed also necessary for this purpose to have knowledge of the physical properties (hygroscopicity, pore space, capillarity, water capacity, relation to root hairs, flocculation, Brownian movement, etc.) of the different grades of soil particles. Moreover, many soils are rich in ultramicroscopic bodies and the properties of such soils will be determined largely by the nature and properties of the colloid bodies present.

The author proposes and explains a system of classifying such soils by their varying degrees of plasticity. For this purpose the ordinarily accepted classifications of soil particles do not go far enough into the microscopic and ultramicroscopic particles, but he approves of the proposed international classification (E. S. R., 31, p. 417). Ordinarily it is necessary for a rational classification to take account only of particles 2 mm., 0.2 mm., 0.02 mm., and 0.002 mm. and less in diameter. The author's apparatus and methods for mechanical analysis of soils, especially for the separation of the very fine microscopic and ultramicroscopic particles, are described.

Soils containing more than 50 per cent of coarse sand (2 to 0.02 mm.) are considered dry sandy soils fit only for forestry. Soils containing more than 50 per cent of fine sand (0.2 to 0.02 mm.) or silt (0.02 to 0.002 mm.) may be classed as loamy clay, normal loam, or loamy sand. Soils containing more than 50 per cent of colloid particles (0.002 mm. or less) are very heavy, highly plastic clay soils. The importance and value of determining the degree of plasticity in the latter class of soils are especially emphasized, and simple methods of determining the limits of (1) fluidity, (2) "rolling out," and (3) sticky plasticity are described.

Two natural classes of clay soils based on such determinations are distinguished, (1) highly plastic (sticky) clays containing more than 50 per cent of colloid particles, and (2) less plastic soils containing more than 50 per cent of fine sand or silt. The determination of plasticity of clays is preferred to mechanical analysis because it is very simple and much more rapid. Further study of the colloid substances which determine the plasticity of soils is in progress.

The course of denitrification in soils of different water content, O. LEMMERMANN and J. L. WICHERS (*Centbl. Bakt. [etc.]*, 2. Abt., 41 (1914), No. 18-23, pp. 608-625, fig. 1).—The authors review work of others bearing on the subject and report comparative studies of three soils of different water-holding capacities with reference to the intensity of the denitrification process. With the same relative water content with reference to the total water capacity entirely different results as regards nitrate reduction were obtained with the three soils. The most nitrates were destroyed in all three soils when the water content corresponded to the total water capacity. The formation of elementary nitrogen decreased with decreasing water content, but was not always the least with the least water content. This is thought to be due to the influence of other bacteriological processes on the denitrification process.

The chemistry of soils: Evolution of purins, G. CHARDET (*Rev. Gén. Chim.*, 17 (1914), No. 10, pp. 154, 155; *abs. in Chem. Zentbl.*, 1914, II, No. 10, p. 655).—In continuation of a previous article (E. S. R., 31, p. 515) the author briefly discusses certain theoretical considerations involved in the breaking down of nucleo-proteids with simultaneous formation of purin bodies. It is concluded that the purin bases occur in the soils either as nucleic acids derived from vegetable alkaloids or formed from the nucleo-proteids of dead micro-organisms. They occur in very small amounts in soils and it is not likely that they exert any considerable influence on plant growth.

The effect of deciduous and evergreen trees on the soil and its vegetation, A. KOCH (*Centbl. Bakt. [etc.]*, 2. Abt., 41 (1914), No. 18-23, pp. 545-572, pls. 4).—The author reviews the work of others bearing on the subject, and reports studies of the humus of pine and beech forest soils and of the volatile oils and other products of conifers with reference to the germination of seeds, the growth of plants, and the life and activity of yeasts and soil and other bacteria.

Buckwheat and cabbage plants and beech and pine seedlings grew much better in the beech humus than in the pine humus. Both kinds of humus were

found to be better stocked with plant food than a productive field soil. The pine humus reacted weakly acid and liming slightly improved growing conditions.

Turpentine and carvene when applied to a loam soil retarded the germination of corn, but this effect was apparent only during germination. No effect was observed with these products when used in the presence of tannin. Silver pine-needle oil slightly retarded germination and chlorophyll formation. The addition of ground pine needles to soil, while apparently not affecting germination, retarded the growth of the plant, which effect the author attributes to the favorable influence of the pine needle cellulose on the activity of denitrifying bacteria rather than to poisonous secretions. Formic acid strongly retarded germination. Carvene and turpentine were both temporarily but increasingly toxic to corn plants. The vapors of a number of the volatile conifer products were found to be more or less toxic to *Impatiens sultanii*, rape, and cresses.

The volatile products also retarded the formation and activity of soil ferments, were more or less toxic to soil and milk bacteria, and, with one exception, more or less retarded the formation of nitrates from the ammonia of urine.

The oxidation of ammonium sulphate in beech humus was marked, while in pine humus it was either small or negative. Comparative studies of the effects of decomposing beech leaves and pine needles on the reduction of sodium nitrate showed them to be about equally active. The volatile products had little retarding influence on the reduction of sodium nitrate but markedly retarded the bacterial decomposition of cellulose.

It is concluded from these studies that the most of the different coniferous products tested are toxic to higher plants, yeast, and bacteria, and that the humus of pine forests, in contrast to the humus of beech forests, has a generally unfavorable effect on plant growth.

A list of references to literature bearing on the subject is appended.

Field test with toxic soil constituent: Vanillin, J. J. SKINNER (*U. S. Dept. Agr. Bul.* 164 (1915), pp. 9, pls. 4).—Pot and field experiments on the effect of vanillin, a soil constituent (*E. S. R.*, 30, p. 610), upon plant growth are reported.

In pot experiments using a loam soil clover was stunted in growth and its green weight reduced 53 per cent when 100 parts per million of vanillin was present. In pot experiments with wheat using an infertile sand, an infertile sandy loam, and a fertile loam vanillin in concentrations varying from 100 to 500 parts per million was harmful in the two infertile soils and had no effect in the fertile soil. The negative effect in the fertile soil is attributed to its stronger oxidizing power.

In field experiments on an acid silty clay loam with cowpeas, string beans, and garden peas the harmful effect of the vanillin when added at the rate of 285 lbs. per acre was noticeable from the beginning and throughout the experiments. Six months after application this soil still contained vanillin, and when used in pot experiments was harmful to wheat, cowpeas, string beans, and garden peas.

The number and growth of protozoa in soil, J. M. SHERMAN (*Centbl. Bakt. [etc.]*, 2. Abt., 41 (1914), No. 18–23, pp. 625–630; *abs. in Internat. Inst. Agr. [Rome]*, *Mo. Bul. Agr. Intel. and Plant Diseases*, 5 (1914), No. 9, pp. 1165, 1166).—Studies, using the dilution method, on sixteen soils representing various types under various treatments as to cultivation indicated that the normal fertile soil has a protozoa content approximating 10,000 per gram. "The flagellates constitute the greater portion of the protozoan fauna of the soil, and not the ciliates nor amœbæ. *Colpoda cucullus* appears to be the most widely distributed ciliate in soil, and may occasionally be found in numbers approximating 1,000

per gram. The amœbæ do not ordinarily occur in numbers nearly as great as do the flagellates. Certain forms of the soil protozoa are active under normal, and even subnormal, conditions of moisture. The active protozoan inhabitants of most soils are probably restricted to the flagellates. *C. cucullus* is probably active whenever the moisture content is much above normal, but does not appear to be so ordinarily."

Methods of soil sterilization for plant beds and greenhouses, A. D. SELBY and J. G. HUMBERT (*Ohio Sta. Circ. 151 (1915), pp. 65-74, figs. 2*).—This circular describes the perforated pipe and inverted pan methods of steam sterilization and the formalin method of sterilization for plant beds and greenhouse soils, gives cost data for the different methods, and notes reports on practice in sterilizing soils. The estimate of costs of operation by the different methods is \$15.40, \$12.20, and \$21, respectively, to treat a house 3,000 sq. ft. in area.

As regards soil sterilization, it is stated that "in general, a sandy soil will require less time to be thoroughly heated to the desired depth than will a silt-loam soil or one of heavier clay. . . . A dry soil, and particularly one containing a high percentage of humus, will be very apt to suffer some injury, especially in that portion next to the steam pipes. Light soils, and those rich in humus, would better be steam treated with the pan method. . . . In practice soil should be wetted to the extent of a little less than good growing conditions when steamed either by pipes or by the pan method; this condition will generally be found satisfactory in using the formaldehyde drench. . . . Great caution must be observed that a recently steamed soil is not overwatered, thus giving it the water-logged structure which prohibits or greatly retards growth of plants. . . . Beds treated with formaldehyde (3 pints to 50 gal. of water or stronger) should be stirred every few days to rid the soil of fumes poisonous to young plants, and such beds should not be seeded or planted for a period of ten days after the drench is applied."

The present position of the science of manuring in Germany, M. HOFFMANN (*Internat. Inst. Agr. [Rome], Mo. Bul. Agr. Intel. and Plant Diseases, 5 (1914), No. 8, pp. 976-984*).—It is stated that while "the weightiest problem of the science of manuring, namely, how to find out, rapidly and surely, the manurial requirements of a given piece of land before a crop is put into it," has not yet been solved, considerable progress in this direction has been made possible by the work of König on the treatment of soil by steam under pressure, by Mitscherlich on the use of solutions of carbon dioxid, and by Gerlach on the use of 2 per cent citric acid as means of determining the available plant food of soil, and by the work of Wagner and Pfeiffer on plant analysis. It is stated that Wagner's conclusion that meadows, the air-dried hay of which contains less than 2 per cent of potash, 0.7 per cent of phosphoric acid, and 1 per cent of lime, need applications of these substances has been repeatedly confirmed, and attempts are being made to establish similar standards for cereals. Generally, however, field and pot experiments are still to be considered the best means of determining the fertilizer requirements of soils and crops.

In default of such experiments "soil statics," or keeping account of income and outgo of soil fertility, is recommended as a useful guide in fertilizing. Another guide is furnished by the fact that in normal plants, with the possible exception of Leguminosæ, the relative proportions of plant food constituents are approximately nitrogen 100, phosphoric acid 50, potash, 150, and lime 80. "The farmer who reckons out his stock of the principal plant foods per acre for each piece of arable land on the basis of an up-to-date and complete soil analysis, and from this subtracts the quantity of plant foods contained in the forthcoming crop at harvest (allowing about 1 per cent for wastage) on the

above ratio, will be able to measure approximately, before the annual crop sowing, the quantities of manure which he must still apply to his land. In doing this, however, he must take into consideration the average coefficients of utilization of the said plant foods and all the other factors which influence the productive capacity of the soil."

It is recognized that while these suggestions may be extremely helpful, "there exists at present no method at once rapid and entirely free from objection, of determining the manurial requirements—not the plant food requirements—of a soil, and there is not likely to be one until the biological and colloido-chemical actions taking place in the soil have been more clearly defined."

In dealing with questions of fertilizing it is useful to keep in mind the law of minimum as defined by Liebig, or the law of physiological relations as defined by Mazé and Mitscherlich, and here it must also be borne in mind "that certain factors formerly regarded as being present in excess, for example, carbonic acid, are now suspected of being present only in the minimum quantity." Account must be taken of the variation in assimilating power of different plants, as explained in Strakosch's "law of the variation of work done by plants" and in his idea of assimilative effect (E. S. R., 30, p. 332).

As shown by Schulze and von Seelhorst, with the roots and stubble or even the whole plant of leguminous crops turned under, the soil can not be depended upon to produce maximum crops. Only about 30 per cent of the nitrogen of green manures has been shown by von Seelhorst (E. S. R., 30, p. 24) to be utilized by a three-course rotation.

To get the best results solid and liquid manures should be stored separately. "The liquid manure should be kept from contact with the air in a tank with a lid, and should also be covered with a layer of petroleum or oil."

Experiments which have been carried on for 70 years on a farm at Wingendorf near Freiberg, Saxony, seem to show that complete replacement of farm manures by commercial fertilizers "can not be continued through several decades without fundamentally impairing the yield, except on good soils containing plenty of humus, and even then, only when the remains of the roots and stubble are allowed to accumulate for the enrichment of the soil." However, it is shown that the great increase in the systematic and scientific use of fertilizers in Germany has been accompanied by a corresponding increase in crop yields.

In the author's opinion "the quintessence of human art in agriculture lies . . . in the correct application of fertilizers to well prepared soil, and in sowing productive varieties."

Some facts about commercial fertilizers in New York State, L. L. VAN SLYKE (*New York State Sta. Bul. 392 (1914), pp. 585-625*).—This bulletin (1) calls attention to differences in cost of plant food in commercial fertilizers sold in New York, with suggestions as to the more economical purchase of such plant food, (2) discusses the relation of guaranteed to actual composition, and (3) shows that the present state fertilizer law "needs amendment in order to limit more carefully the amounts of deficiencies that are absolutely exempt."

It is shown among other things that "the tendency among farmers at the present time appears to be in the direction of purchasing more high-grade mixtures, [but that] in complete fertilizers as well as in other mixtures and unmixed materials, the variation in selling price is often wholly out of proportion to the amount of plant food present. . . . Plant foods can be purchased generally in unmixed materials at less cost than in mixtures."

The analyses of fertilizers sold in the State in 1914 show that "in the case of each constituent of complete fertilizers, the number of samples showing results

above the guaranteed statement of composition is much larger than the number below. . . . In the case of fertilizer materials and mixtures other than complete fertilizers, the average percentage found is above that guaranteed in all cases excepting fish scrap and calcium (lime) carbonate." However, "the present law permits absolute exemption of deficiencies of plant food amounting in some cases to a value of \$5 or more per ton [and] in the case of high-grade fertilizers and especially of fertilizing materials . . . offers an opportunity for cheating farmers with impunity."

Fertilizer facts for farmers, F. H. HALL (*New York State Sta. Bul. 392, popular ed. (1914), pp. 8, fig. 1*).—A popular edition of the above.

The action of sulphate of ammonia and superphosphate of ammonia in calcareous soils, J. WLODECK (*Abs. in Internat. Inst. Agr. [Rome], Mo. Bul. Agr. Intel. and Plant Diseases, 5 (1914), No. 8, pp. 1004, 1005*).—In field experiments with cereals on calcareous and sandy soils to determine losses of nitrogen from ammonium sulphate and to test the behavior of superphosphate of ammonia in calcareous soils, it was found that while the superphosphate was about equally effective on the two soils, the sulphate gave much lower results on the calcareous soil than on the sandy soil. The conclusion is drawn that the unfavorable result with the sulphate on the calcareous soil was due to volatilization of ammonia, and that losses of as much as 20 per cent of the ammonia may result from this cause whereas with superphosphate of ammonia such losses can be avoided or considerably reduced.

The cyanamid works at Niagara Falls (*Engin News, 73 (1915), No. 1, pp. 16-21, figs. 5*).—The present status of the synthetic nitrogen industry, with particular reference to the cyanamid process, is reviewed, and the works at Niagara Falls, Ontario, is described. It is stated that the present annual production of cyanamid is as follows: Odda, Norway, 72,000 metric tons; Alby, Sweden, 16,000; Piano d'Orta, Italy, 6,000; Terni, Italy, 25,000; San Marcel, Italy, 3,000; Martigny, Switzerland, 12,000; Notre Dame de Briancon, France, 7,500; Trostberg, Bavaria, 25,000; Gross-Kayne, Germany, 6,000; Knapsack, Germany, 20,000; Selenico, Dalmatia, 6,000; Dugriat, near Almissa, 15,000; Kagami, near Kumamoto, Japan, 16,000; and Lonza, Switzerland, 15,000 metric tons; and Niagara Falls, Ontario, 64,000 long tons. Practically the entire American output of cyanamid is used in the preparation of mixed fertilizers.

The Niagara Falls factory occupies a plat of 40 acres, covers 12 acres of floor space, represents an investment of \$3,000,000, normally employs continuously day and night about 750 men and 30,000 horsepower of electrical energy, and produces cyanamid of a sales value of approximately \$2,750,000 a year.

Comparison of silicates and carbonates as sources of lime and magnesia for plants, W. H. MACINTIRE and L. G. WILLIS (*Jour. Indus. and Engin. Chem., 6 (1914), No. 12, pp. 1005-1008, figs. 2*).—The authors review previous work indicating that calcium and magnesium more commonly occur in soils as silicates than as carbonates and report tests of the carbonates and silicates in pot experiments with clover. The soil had a lime requirement of about 1 ton per acre surface foot. The substances tested were used in amounts furnishing the equivalent of 16,070 lbs. per acre in excess of this requirement.

The results indicated that "calcium and magnesium mineral silicates, wollastonite, and serpentine were very beneficial when applied either singly or jointly. . . . Calcium silicate is decidedly superior to calcium carbonate, both in its effect upon plant growth and as a form tending to conserve lime in soils."

The comparative effect on different kinds of plants of liming an acid soil, B. L. HARTWELL and S. C. DAMON (*Rhode Island Sta. Bul. 160 (1914), pp. 407-446, pls. 4*).—This bulletin summarizes the results secured during 22 years (1903

to 1914) on four plats equally and liberally fertilized as regards nitrogen, phosphorus, and potassium, two of the plats receiving their nitrogen in ammonium sulphate and the other two in sodium nitrate, and one of each pair receiving slaked lime from time to time.

The results of the first eight years' experiments of this series have been previously reported (E. S. R., 15, p. 672).

During the 22 years the plats received average annual applications of 44.5 lbs. per acre of nitrogen in ammonium sulphate or sodium nitrate, 90 lbs. of phosphoric acid in dissolved boneblack or acid phosphate, and 114 lbs. of potash in muriate of potash. The total application of lime during the period was 6,350 lbs.; 4,750 lbs. in two applications in 1893 and 1894, and 800 lbs. in 1902 and again in 1912.

The lime requirements of the soil at different dates as indicated by the Veitch method were as follows:

Lime requirements of different fertilizer plats in 1904, 1912, and 1914.

Kind of plat.	Calcium oxid required per acre of soil.		
	1904	1912	1914
	<i>Lbs.</i>	<i>Lbs.</i>	<i>Lbs.</i>
Unlimed ammonium sulphate plat.....	4,700	5,500	7,784
Limed ammonium sulphate plat.....	1,100	3,200	4,607
Unlimed sodium nitrate plat.....	2,500	4,200	4,210
Limed sodium nitrate plat.....	0	2,600	3,069

About 280 different kinds of plants have been grown upon the plats, classified as follows: Flowers (mostly perennials), 75; trees and small fruits, 25; grasses and clovers, 30; and miscellaneous crops, 150. The behavior of the different plants as regards the condition of the soil are presented in concise tabular form. It is shown that the behavior of the different plants toward liming is influenced to a marked extent by the residual effect of ammonium sulphate and sodium nitrate. The plants tested included those representing all grades, from such as are positively injured by an application of lime, even to a very acid soil, to such as are unable even to live on an acid soil and are greatly benefited by liming.

Prominent among the flowers which seemed to be quite tolerant of soil acidity were blue false indigo, marigold, tickseed, evergreen, Japanese bell flower, Nicotiana, scarlet sage, and catchfly. Of the trees tested Norway spruce, birch, and peach seemed to be particularly tolerant of soil acidity. Of the fruits the Blackcap raspberry was more productive on the unlimed than on the limed plats, whereas the opposite was true with the Cuthbert raspberry. The most pronounced case of injury from liming was represented by the cranberry.

Of the grasses redbud and Rhode Island bent grew well on the unlimed plats. The growth of the clovers varied with the source of nitrogen, some of them growing about equally well on the sodium nitrate plats whether lime was added or not. With the exception of cowpeas, lupines, serradella, and vetch the leguminous plants were, as a rule, however, benefited by lime. Japanese millet seemed to grow best on the most acid soil.

The conditions in these experiments were not such as to make it possible to compare the relative efficiency of ammonium sulphate and sodium nitrate as sources of nitrogen for the different crops since the reaction of the soil was not

optimum for the growth of the particular kind of plant under experiment. "To create such a condition there would usually be required the addition of a larger amount of lime in connection with sulphate of ammonia, because it is physiologically acid; and inasmuch as such larger amount has not thus far been applied in the present experiment, only those plants which prefer moderate soil acidity have usually grown better on the limed sulphate of ammonia plat than on the limed nitrate of soda plat, whereas the reverse is true of those plants which are sensitive to acidity. This indicates that in the present experiment the reaction of the soil may have had a more important influence on growth than the form of the nitrogen."

The use of lime on land, F. D. GARDNER (*Pennsylvania Sta. Bul. 131 (1914), pp. 171-204, figs. 3*).—The wide distribution in Pennsylvania of acid soils, that is, soils on which clover fails, is pointed out, this condition being attributed to a deficiency of lime which may occur even in soils originally rich in lime. Reference is made to numerous tests which have shown that red clover fails when the lime requirement of the soil is 1,500 to 1,700 lbs. of burnt or caustic lime, equivalent to 2,700 to 3,000 lbs. of carbonate of lime or crushed limestone per acre to a depth of 7 in. On the other hand, red clover grows without serious check on a soil of which the lime requirement is only 500 to 1,000 lbs. per acre. In ordinary farm practice the acidity seldom becomes so marked as to affect noticeably the growth of cereals and grasses.

Pot experiments made by the station are cited to show that finely pulverized limestone is as prompt and effective in correcting soil acidity and promoting the growth of clover as equivalent amounts of caustic lime. The station field experiments extending over a long period of time showed a steady increase in the lime requirement and in the benefit from liming and that the lime requirement of soils is greatly increased by the continued use of ammonium sulphate. The field tests indicated no advantage in applying more than sufficient lime to neutralize the acids present in the soil and showed that large applications varying from 1,980 to 29,556 lbs. per acre were wasteful so far as the needs for five or six years are concerned. It was found that "the lime requirement indicated by the Veitch method falls about one-third short of the actual amount of lime advisable to apply under field conditions. This suggests that a third to a half more of lime should be applied in farm practice than is indicated by the Veitch method if the soil is to be neutral after one or two crops have been grown."

Fertilizer analyses, A. J. PATTEN, O. B. WINTER, and O. F. JENSEN (*Michigan Sta. Bul. 274 (1914), pp. 3-28*).—Analyses of 327 brands of fertilizers licensed for sale in Michigan in 1914 are reported, with a general discussion of the results of the inspection and the text of the state fertilizer law as amended in 1913.

The fertilizer inspection for 1914, B. E. CURRY and T. O. SMITH (*New Hampshire Sta. Bul. 173 (1914), pp. 11*).—Analyses of 184 brands of fertilizers offered for sale in New Hampshire during the year are reported. It is stated that these brands "almost without exception, have met their guaranty in every respect." Reference is made to a so-called mineral fertilizer, the approximate value of which, on the basis of analysis, was 60 cts. per ton, or one twenty-fifth of the price at which it sells wholesale.

Analyses and valuations of commercial fertilizers, fertilizer supplies, and home mixtures, C. S. CATHCART ET AL. (*New Jersey Stas. Bul. 272 (1914), pp. 43*).—Analyses and valuations of 576 fertilizers and fertilizing materials, representing a portion of the brands of fertilizers collected and examined during the season of 1914, are reported and discussed.

AGRICULTURAL BOTANY.

Handbook of technique for teachers and students of natural science, B. SCHMID (*Handbuch der naturgeschichtlichen Technik*. Leipzig: B. G. Teubner, 1914, pp. VIII+555, figs. 381).—This book, prepared by collaboration of the 15 authors named, is intended to bring together such information, directions, and suggestions as may prove helpful to instructors or students in any one of several branches of natural science. It is divided into sections partly corresponding to the usual divisions and the main requirements of such work in the field, laboratory, and museum, but partly grouping together features of more general application and common technique, as in photography.

The arrangement, preparation, care, and use of the laboratory, specimens, materials, and instruments, covering a wide range of studies, are treated in more or less detail. Lists are given of related scientific and pedagogic literature, and the work concludes with an index.

Culture media for use in the plate method of counting soil bacteria, H. J. CONN (*New York State Sta. Tech. Bul.* 38 (1914), pp. 34).—The author describes the use of two culture media, one of which is a soil-extract gelatin and the other an agar medium containing no organic matter except the agar, dextrose, and sodium asparaginate.

The soil-extract gelatin is recommended for use when the plate method is employed as a preliminary procedure in a qualitative study of soil bacteria. The chief advantage of the asparaginate agar is said to be that it contains no substance of indefinite composition except the agar itself. This, it is thought, would allow comparable results to be obtained by its use, even though the work was done in different laboratories by different individuals.

Four other media that have been recently discussed were compared with the media mentioned above, but for qualitative work they were all found to be inferior. For quantitative work they are said to be undesirable because they contain substances of indefinite composition.

The chemical dynamics of living protoplasm, W. J. V. OSTERHOUT (*Abs. in Science*, n. ser., 41 (1915), No. 1048, p. 174).—The author claims it is possible, by means of electrical measurements, to follow reactions in living protoplasm without interference with the progress of the reaction or injury to the protoplasm. It is also considered possible to determine the order of the reaction and to ascertain whether the reaction is reversible. In many cases it appears that the reaction is reversible up to a certain point, but beyond this it is irreversible.

The mechanism of exchange between plants and external media, P. MAZÉ (*Compt. Rend. Acad. Sci. [Paris]*, 159 (1914), No. 3, pp. 271-274).—Claiming to have shown previously (*E. S. R.*, 31, p. 221) that the elaboration of a given weight of vegetable matter requires the use of a constant volume of nutritive solution of definite composition and concentration (this law dominating the whole economy of the plant and regulating exchanges with its external medium), also that roots excrete mineral and organic substances, this fact disagreeing with the hypothesis of a protoplasmic semipermeable membrane, the author gives tabulated results of a study on the rôle of osmosis in this connection as exemplified by maize growing in sun or shade and supplied with a nutritive medium including from 2 to 5 per cent of sugar.

The conclusion is drawn that the law of osmosis does not operate in any important degree to affect exchanges occurring between roots and nutritive solutions. The plant, it is held, constitutes a system permeable to water and to substances in solution or in colloidal suspension therein, but its per-

meability is essentially regulable not alone in the organs which are in relation with the external medium, but still more within the component tissues.

Evaporation and plant succession in southeastern Washington and adjacent Idaho, J. E. WEAVER (*Plant World*, 17 (1914), No. 10, pp. 273-294, figs. 10).—A preliminary study, as detailed, of the differences of rates of evaporation in the various plant formations and associations in this region is considered to show that these differences are sufficient to be important factors in causing succession, at least through the earlier stages, where light values are usually high.

The effects of acid and alkaline solutions upon the water relation and the metabolism of plants, A. DACHNOWSKI (*Amer. Jour. Bot.*, 1 (1914), No. 8, pp. 412-439, figs. 4).—In extension of previous work (E. S. R., 31, p. 625), experiments are detailed as carried out to ascertain the possible importance of hydrolytic reactions in determining the amount of water absorbed and retained by plants during germination and growth, these experiments employing corn and bean seeds and tomato cuttings.

The results, which are given at length, are thought to justify the general conclusion that the variation in the water content of seeds can not be brought about solely through the concentration of acids and alkalis within the cells and tissues, and that the alterations here noted may be explainable on the hypothesis that hydrolytic changes are taking place whereby the water content in the seeds varies more and more as complete hydrolysis is approached. It is suggested that this work may aid in developing further the conception of antagonistic relations among salts.

A bibliography is appended.

Root habits of desert plants and the reaction of roots to soil temperature, W. A. CANNON (*Abs. in Science, n. ser.*, 41 (1915), No. 1048, pp. 173, 174).—According to the author there are three well-marked types of roots of desert perennials, those which never penetrate the ground deeply, those which penetrate the ground but have few or no roots near the surface, and those which are intermediate between these extreme forms. The relation of these different types of root systems to the temperature of the soils is discussed. It is thought that differences in temperature response, coupled with differences in soil temperature, are the definitive factors which bring about the characteristic distribution in the soil of the roots of the species studied.

Electrolytic determination of exosmosis from the roots of anesthetized plants, M. C. MERRILL (*Abs. in Science, n. ser.*, 41 (1915), No. 1048, p. 176).—The author subjected growing plants of *Pisum sativum* to the influence of illuminating gas and ether vapor to determine their effect on exosmosis from the roots.

Where the roots were exposed directly to the anesthetics the resulting exosmosis was more rapid than where the roots were kept in water during the exposure. In the former case the root turgor decreased greatly, while in the latter case the tops were affected but the roots remained normal in appearance even though the exosmosis was abundant, thus indicating a disappearance of mineral nutrients from the tops. With older plants the increased conductivity was less than with younger plants, indicating a greater resistance to the anesthetics.

The germination of belladonna seed, A. F. SIEVERS (*Amer. Jour. Pharm.*, 86 (1914), No. 11, pp. 483-505, figs. 10).—Detailing studies as carried out, the author states that freezing accelerates germination, that seed size shows no influence (but high specific gravity indicates high germinability), that color has no meaning in this connection, and that sulphuric acid treatment has no great

value as a means of increasing germinability. Scratching the seed coats with powdered glass or emery, while helpful, does not produce so good results as does treatment with hydrogen peroxid, which was of material benefit, the effect reaching the maximum at 60 per cent strength of the solution when applied to the seeds for not over 18 to 24 hours.

Pollen development in the grape with special reference to sterility, M. J. DORSEY (*Minnesota Sta. Bul.* 144 (1914), pp. 60, pls. 4).—A report is given of an investigation conducted to determine the cause of sterility in grapes and whether it can be controlled. As a basis of the investigation studies were made of the variety Brighton, which is said to be typical of a number of sterile or nearly sterile cultivated varieties of grapes. Comparisons are also made with the parent varieties from which Brighton was derived, as well as a number of other species and varieties.

The factors bearing upon the phenomenon of sterility were found capable of being divided into two classes, those inherent to the plant and those resulting from an unfavorable environment. In the grape the inherent cause of sterility was found to be due to the pollen rather than the pistil. Cytological studies of the pollen showed that sterile pollen in the grape results from degeneration processes in the generative nucleus or arrested development previous to mitosis in the microspore nucleus. Aborted pollen is found in varying quantities with both sterile and fertile pollen. It occurs in pure forms as well as in hybrids, but is usually more abundant in the latter. Since pollen is produced in abundance by the grape, aborted pollen is relatively unimportant from the standpoint of fertilization or the setting of fruit.

As a practical deduction from his investigations, the author states that as both fertile and sterile hybrids occur among the cultivated varieties of American grapes, hybridity is not necessarily a cause of sterility. It is evident that the cause of sterility in the grape is deep-seated and intimately connected with the functional activity of pollen, and can not be overcome by cultural conditions, but will have to be avoided by mixing varieties in the vineyard at planting time.

A bibliography is given.

Injury and abscission in *Impatiens sultani*, F. E. LLOYD (*Ann. Rpt. Quebec Soc. Protec. Plants [etc.]*, 6 (1913-14), pp. 72-79, figs. 11).—After noting contributions by others, the author gives results of his own studies with *I. sultani*.

Injury does not seem to cause abscission. The abscission layer lies just above the base of the internodes, but it is not strictly limited to any particular position, the point of its occurrence being determined physiologically. There is no special abscission tissue, the immediate cause of abscission being, it is claimed, the hydrolysis of the middle lamella, no disintegration of tissues occurring in any other sense. Increased turgor is claimed to play no part in this connection.

Some relations of plants to distilled water and certain dilute toxic solutions, M. C. MERRILL (*Abs. in Science, n. ser.*, 41 (1915), No. 1048, p. 176).—A determination was made of the interval during which pea seedlings could be left in redistilled water and in certain toxic solutions and then recover when later placed in a full nutrient solution. Horse beans (*Vicia faba*) were more marked than pea seedlings in their behavior toward the renewal of distilled water, those in which the distilled water was renewed showing more than double the growth. Bacterial and fungus action was found to be undoubtedly an important factor, and the evidence obtained indicates that there are several factors entering into the so-called harmful action of distilled water.

A study of vanadium and the action of vanadates in vegetables, E. C. RAMÍREZ (*Datos Para el Estudio del Vanadio y Acción de Algunos Vanadatos en los Vegetales. Thesis, Univ. La Plata, 1914; abs. in An. Soc. Quím. Argentina, 2 (1914), No. 6, pp. 145, 146*).—The author, after a general section on vanadium, a description of the principal vanadium bearing substances in Argentina, and a discussion of methods, gives an account of studies on vanadium as influencing vegetable growth, with the conclusion that this element may be absorbed and stored by plants, which may show anomalies of growth therefrom.

Arsenic and manganese in some vegetable products serving as animal food, F. JADIN and A. ASTRUC (*Compt. Rend. Acad. Sci. [Paris], 159 (1914), No. 3, pp. 268-270*).—In continuation of previous work (E. S. R., 29, p. 628), results are given in tabular form of analyses made of 12 plants (also of certain mixtures thereof) commonly fed to animals used for human food, indicating the percentages of arsenic and also those of manganese found in the fresh or the dry form of each.

On the correlation between somatic characters and fertility, J. A. HARRIS (*Amer. Jour. Bot., 1 (1914), No. 8, pp. 398-411, figs. 4*).—The author presents data bearing upon the relationship of somatic development (as measured by the fruits borne by the individual plant) to fruit fertility (as measured by the number of ovules forming and of seeds developing).

Data obtained and analyzed are considered to indicate that the correlation between number of pods per plant and number of ovules per pod is positive but low, and that the correlation between pods per plant and seeds per pod is for the most part positive and lower.

It is held that "there is some correlation between the number of pods per plant and the number of ovules which develop into seeds, which is in part at least independent of (although it may be inseparably bound up with) the morphogenetic factors which link together the magnitudes of the two characters," pods per plant and ovules per pod. This correlation is designated as more truly physiological than morphogenetic, although there is thought to be no very sharp line of demarcation between the physiological and morphogenetic in problems of the kind here considered.

Hybrids of *Oenothera biennis* and *O. franciscana* in the first and second generations, B. M. DAVIS (*Abs. in Science, n. ser., 41 (1915), No. 1048, p. 177*).—The author reports upon a study of 1,806 plants grown from reciprocal hybrids of the above species of *Oenothera*. The second generation of this cross is said to present a wide range of forms, and among them were a number of plants with combinations of characters that appear to have fulfilled in essentials the requirements of synthetic *O. lamarckiana*-like hybrid.

Inventory of seeds and plants imported by the Office of Foreign Seed and Plant Introduction during the period from October 1 to December 31, 1912 (*U. S. Dept. Agr., Bur. Plant Indus. Inventory No. 33 (1915), pp. 60, pls. 5*).—This inventory gives a descriptive list of about 400 numbers of seeds and plants imported from various parts of the world for testing in the United States.

FIELD CROPS.

Grass pastures for irrigated lands, J. S. WELCH (*Idaho Sta. Bul. 80 (1914), pp. 15, figs. 3*).—This bulletin describes methods of seeding, irrigating, and care of irrigated grass pastures in which Kentucky blue grass, smooth brome grass, orchard grass, timothy, meadow fescue, redtop, tall meadow oat grass, English rye grass, Italian rye grass, Canada blue grass, white clover, alsike clover, and red clover were used singly and in mixtures. The value of these

grasses was measured by grazing tests with cows, sheep, and steers. Conclusions are given as follows:

Irrigated grass pastures produce returns that warrant their use even on comparatively high-priced land. Of all the grasses tested, Kentucky blue grass, smooth brome grass, orchard grass, timothy, and meadow fescue have proved the best.

"White, or alsike clover, is desirable in a very small proportion. More than three or four lbs. per acre may cause bloat. Mixtures give better results than any variety seeded alone. Different conditions require different mixtures. A total of about 28 lbs. of seed per acre is necessary.

"Seed should never be bought in mixtures. Thorough seed-bed preparation is absolutely essential. Grasses can be seeded any time from early spring to the middle of July. Fall seeding is not advisable. Broadcasting the different varieties separately is the most satisfactory method of seeding. The seed should be covered lightly with a spike-tooth harrow or good brush drag. Under average conditions a nurse crop should not be used.

"Irrigation water should be applied by the corrugation method during the first season; thereafter flooding between borders is recommended. The pasture should have frequent irrigation and during the entire season should receive a total of about 2.5 acre feet per acre. Early seeded pastures can be grazed lightly late in the first season. The pasture should be divided into at least two parts and should not be grazed too closely. Barnyard manure can be used on the pasture with good results. Some shade should be provided for the animals.

"Grazing tests at the station indicate that an acre of good mixed grass pasture will maintain two good dairy cows or three medium-sized beef steers during May, June, July, August, and part of September. The sheep grazing tests have not been very conclusive but indicate that an acre will maintain about 12 ewes and their lambs. The conclusions reached at the station are being substantiated by the experience of irrigation farmers in different parts of the State."

Soil fertility investigations, A. T. WIANCKO (*Indiana Sta. Rpt. 1914, pp. 58-60*).—Brief notes are given stating the successful use of soy beans and cowpeas in rotations to improve the soil fertility at the university farm and on the outlying fields of the State. As results of phosphate and manure treatments on the Scott County and Pike County fields it is noted that "the comparison of acid phosphate and raw rock phosphate used in conjunction with liberal liming has thus far shown that an application of 24 lbs. of phosphoric acid in acid phosphate once in three years is more profitable than a 2-ton application of raw rock phosphate put on at the rate of 1 ton per acre at the beginning of the experiment in 1906 and a second ton in 1911. The total value of the increase in eight corn crops and nine wheat crops, including straw and stover, and two clover hay crops which were removed from the land, has been \$87.41 for the acid phosphate and \$68.58 for the raw rock phosphate, yielding net profits of \$71.84 and \$54.58, respectively.

"Where ten tons per acre of manure were applied every three years on corn, the value of the increase was \$170.63 with a net profit of \$10.63 after allowing \$2 for each ton of manure used. Where two tons per acre of raw rock phosphate was added to the same manure treatment, the total value of the increase was only \$8.21 greater for the entire period and the net profit, after allowing \$2 per ton for the manure and \$7 per ton for the rock phosphate, was \$5.79 less than where manure alone was used. On the Pike County field, which was in a much better state of fertility to begin with, the addition of rock phosphate to the manure treatment showed only \$8.55 net returns for the

entire period, or approximately \$1 per acre per annum; the rock phosphate alone showed a loss of \$3.57, while the acid phosphate alone showed a gain of \$2.41 during the same period.

"These experiments, therefore, indicate that under the conditions prevailing on these two fields acid phosphate is more profitable as a source of phosphorus than is raw rock phosphate."

Report of the division of farm crops, V. M. SHOESMITH (*Michigan Sta. Rpt. 1914, pp. 235-239*).—In this report F. A. Sprogg notes that two strains of winter barley have been developed to withstand Michigan winters satisfactorily. The improvements of wheat, oats, corn, and alfalfa as results of breeding and selection work are also briefly noted.

Data are given showing results in fertilizer experiments with wheat and corn, and in rotation experiments. It is stated, however, that these experiments have not been carried on long enough to justify conclusions.

[Experiments with field crops], P. VAN HOEK (*Verslag. en Meded. Dir. Landb. Dept. Landb., Nijv. en Handel, No. 3 (1914), pp. 47-154*).—Results of a variety test of potatoes for starch manufacture and of table potatoes are given, the latter being grown on both clay and sandy soils. The starch content of the former kinds ranged from 15.7 to 16.15 per cent.

The data show a considerable increase in yield, especially of marketable size tubers, as a result of seed selections. Results of spraying with Bordeaux mixture showed large increases, especially in the marketable sizes of the sprayed crops. In tests of the use of from 400 to 900 kg. per hectare (356 to 801 lbs. per acre) of nitrate of soda, covering the years 1908-1912, it was found that about 600 kg. gave the most profitable results.

Variety tests of sugar beets covering the years 1907-1911 are reported.

Studies of the influence of the application of from 200 to 600 kg. per hectare of nitrate of soda on the sugar content of beets for the years 1910-1912 showed a lack of uniformity.

The results of variety and manurial tests with mangels and turnips, cereals, beans, peas, flax, and of a test of inoculation of legumes and spraying for weed destruction are given.

In several years' experiments with grass lands a top-dressing of kainit and slag meal gave no results the first year. Kainit alone nearly doubled the yield, slag meal alone gave no increase, while 2 parts (1,000 kg. per hectare) kainit and 1 part of slag meal proved better than 1 part kainit and 2 parts of slag meal.

An application of sand to grass plats in the dry year 1911 caused an increase in yield in general on various fertilizer plats and improved the quality of the growth. In manurial tests complete commercial fertilizer on grass lands during 1899-1912 gave better results than barnyard manure or loam dressing.

Varietal tests 1914—ground nuts, maize, and rice, F. A. STOCKDALE (*Dept. Agr. Mauritius, Gen. Ser., Bul. 3 (1914) [English Ed.], pp. 10*).—This bulletin reports yields and analyses of several varieties of peanuts and maize and yields of several varieties of rice.

On the plant food absorption and growth of *Agropyrum repens*, H. BURMESTER (*Fühling's Landw. Ztg., 63 (1914), No. 16, pp. 547-556, fig. 1*).—This article describes pot experiments designed to determine to what extent *A. repens* suffers by deep covering of the rhizomes, to what extent it withdraws plant food from soils of varying fertility, and to what extent a crop suffers in its presence on soils of varying fertility. The following results are given:

When the rhizomes of *A. repens* are covered to a depth of about 12 in. they die. Repeated removals of the leaves of the plant above ground so weakens it

that it will soon die; *A. repens* withdraws abundantly available plant food in proportion to the fertility of the soil, but without appreciable increase in growth of its top. A crop of good stand (oats) prevented *A. repens* from withdrawing appreciable large quantities of plant food from a fertile soil and was little injured by its presence, and scarcely any more plant food was removed from the soil by the association than by oats alone.

Cultivation and composition of comfrey (*Symphytum aspernum*) (*Cultura*, 26 (1914), No. 315, pp. 362-366).—This article briefly discusses the cultivation of this crop, and gives analyses and yields of a Caucasian variety, harvested at different dates throughout the season. The results of this work, performed at the seed-control station at Wageningen, are given in tabular form.

Corn judging, R. A. MOORE (*Wisconsin Sta. Circ.* 8 (1913), 2. rev. ed., pp. 23, figs. 11).—A revised and enlarged edition (E. S. R., 22, p. 233).

Variety work with corn and cotton, C. K. McCLELLAND (*Georgia Sta. Bul.* 113 (1915), pp. 249-256, figs. 2).—Data showing the number of 2-eared stalks, number of barren stalks, and the yield and percentage of corn to ear from 14 varieties of corn for 1914 are given and briefly discussed. The yields ranged from 16.1 to 23.9 bu. per acre, and the percentage of corn to ear from 80.5 to 90.9. The highest yielding variety, Velvet Cob, produced ears averaging 88.5 per cent corn.

The results of testing 32 varieties show yields of seed cotton per acre ranging from 842 lbs. to 1,295 lbs. and the percentage at first picking from 33 to 77. The variety Sawyer Improved, producing the highest yield of lint, 442 lbs. per acre, showed 37 per cent lint and 56 per cent at first picking. The variety Perry Improved, showing the highest percentage at the first picking, gave a yield of only 278 lbs. of lint per acre.

Cowpeas in the cotton belt, W. J. MORSE (*U. S. Dept. Agr., Off. Sec. Spec. [Circ.],* 1915, Feb. 13, pp. 5).—This gives cultural methods and uses.

The dasheen, a root crop for the South, R. A. YOUNG (*U. S. Dept. Agr., Bur. Plant Indus. Doc.* 1110 (1914), pp. 11, pls. 4).—A revision and extension of a paper previously noted (E. S. R., 29, p. 336).

Report of experiments with oat varieties at the Stockholm experiment fields for the period 1908-1912, S. RHODIN (*Meddel. Centralanst. Försöksv. Jordbruksområdet*, No. 100 (1914), pp. 16; *K. Landtbr. Akad. Handl. och Tidskr.*, 53 (1914), No. 6, pp. 435-448).—This article gives results obtained with 15 varieties of early, medium, and late maturing oats. Tabulated data include the yield of grain and straw, days to maturity, dry weight, green weight, weight per hectoliter, and percentage of hull.

The average yields of grain for the different varieties for the period ranged from 2,835 kg. (2,523 lbs. per acre) to 3,779 kg. per hectare, while the percentage of hull varied from 25 to 31.6 per cent. The percentage of hull showed no correlation with the grain yield. The best yielding variety showed the highest percentage of hull, thus making it in actual value the most inferior of all the varieties tested.

Home-mulched vs. northern seed potatoes for eastern Nebraska, R. A. EMERSON (*Nebraska Sta. Bul.* 146 (1914), pp. 5-36, fig. 1).—"Experiments carried on at this station show clearly that it is possible to increase the productivity of potatoes by proper methods of breeding. But potato breeding can not be carried on successfully unless the same stock of potatoes can be kept indefinitely. This can not be done in southern and eastern Nebraska with ordinary methods of culture. The importance of producing improved strains of potatoes for this region makes it desirable to devise a method of producing strong seed tubers at home.

"Since rather low and fairly uniform soil temperatures seem to be essential to the production of high-class seed tubers, the use of a mulch of straw or other coarse material about the plant suggested itself. This method has been under test at the station for eight years, and during that time 22 separate tests have been conducted, all with the Early Ohio variety. In every test a uniform stock of tubers was divided into two lots, one grown by ordinary cultivation and the other one mulched. The seed tubers produced on the two plats were kept under identical conditions over winter. The next spring both were planted in the same way on adjoining plats of as uniform soil as could be had, and both were given the same cultivation throughout the summer. Differences in yield the second year of the test are, therefore, attributable to the different methods of culture by which the seed tubers were produced in the first year of the test. Tests were also made of the effect of different numbers of years of mulching and cultivation.

"In ten comparisons of seed tubers grown one year under a mulch with seed tubers of the same stock grown one year by ordinary cultivation, for each 100 lbs. of tubers produced from mulched seed the cultivated seed produced 62, 68, 70, 70, 76, 80, 82, 83, 88, and 93 lbs., respectively, or an average of 77 lbs. The other 12 tests compared from two to eight years of mulching with the same number of years of cultivation. The results from all the 22 tests are that for each 100 lbs. of marketable tubers grown from mulched seed the average yields of marketable tubers from cultivated seeds were: Cultivated 1 year (10 tests), 77 lbs.; 2 years (4 tests), 68 lbs.; 3 years (1 test), 74 lbs.; 4 years (1 test), 68 lbs.; 5 years (1 test), 66 lbs.; 6 years (2 tests), 61 lbs.; 7 years (2 tests), 49 lbs.; 8 years (1 test), 54 lbs.

"Continued cultivation in southeastern Nebraska results, then, in a pronounced though somewhat gradual deterioration of potato stocks. One year of mulching, however, restores the normal vigor of the stock, as is indicated by two tests as follows: Mulched 6 and 7 years, 100 lbs.; mulched 5 and 6 years and cultivated 1 year, 82 lbs.; cultivated 6 and 7 years, 67 lbs.; cultivated 5 and 6 years and mulched 1 year, 100 lbs.

"Comparisons of home-grown mulched stocks of Early Ohio potatoes with northern-grown stocks of the same variety have been made in five of the eight years. For each 100 lbs. produced on the average by mulched seed tubers, the northern-grown seed tubers yielded an average of 98 lbs.

"Northern-grown seed tubers ordinarily retail for about 25 per cent more than home-grown tubers. The estimated cost of producing seed tubers by mulching is \$10 to \$12 an acre more than the cost of producing them by cultivation, but a mulched seed plat will ordinarily yield about 25 per cent more seed tubers an acre than will a cultivated seed plat. The cost per bushel is, therefore, not greatly different for the two methods. The grower can produce high-class seed tubers at home by mulching at a cost somewhat less than he can buy northern-grown seed of equal quality.

"It is recommended to mulch a few rows of potatoes along one side of the field to furnish seed for the next year's crop. The mulch should be about 4 in. deep after settling and may consist of hay, straw, stable litter, or other coarse material free from grain and noxious weed seeds. It is best applied before the plants come up and must be spread by the time the new tubers begin to develop. To insure that the plants are strong enough to push up through the mulch and to produce as large a yield as possible for a given amount of mulching, large seed pieces from 4 to 6 oz. should be planted. The depth of planting should be the same as in the rest of the field, about 4 in."

The use of Paris green and Bordeaux on the farm, J. W. INCE (*North Dakota Sta. Spec. Bul.*, 3 (1915), No. 14, pp. 239, 240).—This article briefly de-

scribes these and other spray mixtures, the methods of application, and the effect on the potato crop.

The fractional liquefaction of rice starch, F. J. WARTH and D. B. DARABSETT (*Mem. Dept. Agr. India, Chem. Ser., 3 (1914), No. 5, pp. 135-146, pl. 1, fig. 1*).—This paper describes a method of fractional liquefaction of rice starch and its application in differentiating seven varieties of rice. The method involves a wet grinding of the grain and fractional liquefaction of the starch in water at different temperatures for definite periods of time and a conversion secured with malt extract. The samples showed decided degrees of liquefactions at the various periods and uniformity for the same variety.

Field tests of soy beans, 1914 (*Connecticut State Sta. Bul. 185 (1915), pp. 3-17*).—This bulletin briefly discusses the uses of the soy bean as a catch crop, green manure crop, seed crop, silage crop, and for hay for Connecticut farmers, and gives results of tests of 1914 that were planned and carried out by H. K. Hayes and C. D. Hubbell, showing analytical data and composition in comparison with corn and alfalfa.

Data of 19 varieties grown as forage show the total yields to range from 5,389 lbs. to 21,240 lbs., averaging 16,949 lbs. per acre, and the dry matter to range from 1,247 lbs. to 6,287 lbs.

The protein ranged from 2.7 to 7.1 per cent with an average of 4.8, fat from 0.7 to 2.6 with an average of 1.6, nitrogen-free extract from 8.8 to 15.5 with an average of 11.7, and fiber from 4.9 to 12.3 with an average of 8.6.

The highest yielding variety in grain produced 32.5 bu. per acre. Analyses of the grains show the protein to range from 36.8 to 45.5 per cent, fat from 14.1 to 19 per cent, ash from 5.2 to 8.6 per cent, nitrogen-free extract from 26.2 to 32.9 per cent, and fiber from 4 to 6.5 per cent.

The composition and digestible nutrients of soy beans, cotton-seed meal, and linseed meal are compared. Methods of planting soy beans are discussed briefly. The Hollybrook variety is recommended for Connecticut conditions as a crop for soiling, hay, or green manure.

Physiological changes in sweet potatoes during storage, H. HASSELBRING and L. A. HAWKINS (*U. S. Dept. Agr., Jour. Agr. Research, 3 (1915), No. 4, pp. 331-342*).—The results of the investigations conducted at Washington, D. C., with Jersey Big Stem and Southern Queen sweet potatoes are summarized as follows:

“During its growth the sweet potato root is characterized by a very low sugar content. The reserve materials from the vines are almost wholly deposited as starch.

“Immediately after the roots are harvested there occurs a rapid transformation of starch into cane sugar and reducing sugars. This initial transformation seems to be due to internal causes and is largely independent of external conditions. Even at a temperature of 30° C. (86° F.) both cane sugar and reducing sugars accumulate during this initial period in excess of the quantity used in respiration, while during subsequent periods the quantity of reducing sugar diminishes at that temperature as a result of respiration. These initial changes seem to be associated with the cessation of the flow of materials from the vines.

“In sweet potatoes stored at a temperature of 11.7 to 16.7° the moisture content remains fairly constant. There is a gradual disappearance of starch during the first of the season (October to March) and probably a re-formation of starch accompanied by a disappearance of cane sugar during the latter part of the season (March to June). The changes in reducing sugar are less marked than those in cane sugar. The changes in starch and cane sugar appear in a general way to be correlated with the seasonal changes in the temperature.

"In sweet potatoes kept in cold storage (4° C.) there is a rapid disappearance of the starch and an accompanying increase in cane sugar. These changes do not attain a state of equilibrium at that temperature, as the sweet potatoes invariably rot by the action of fungi before the changes have reached their maximum. At both high and low temperatures cane sugar is the chief product formed by the conversion of starch in the sweet potato. The quantity of invert sugar in the root at any time is comparatively small."

A bibliography of cited literature is appended.

On the spike form of wheat, L. DETZEL (*Fühling's Landw. Ztg.*, 63 (1914), No. 17, pp. 561-572).—This article discusses the different forms of spikes of wheats, the arrangements of the spikelets, and the factors which cause the different forms. Statistical data of different type forms are given and the application of the formula $D = \frac{x \cdot 100}{y} + 1$ in which D represents the thickness, x the number of spaces between the spikelets on one side of the spike, and y the length of the spike axis is explained.

Is the present system of grading wheat equitable? E. F. LADD (*North Dakota Sta. Spec. Bul.*, 3 (1915), No. 14, pp. 233-239).—This article criticizes the present market grades of wheat and presents data, compiled as joint cooperative work of the station and this Department, to show that millers, on the basis of their net returns for flour and by-products, could pay more for the lower grades and thus return a large sum to the growers.

Root atlas, B. SCHULZE (*Wurzelatlas. Berlin: Paul Parey, 1911, vol. 1, pp. 36, pls. 36; 1914, vol. 2, pp. 42, pls. 29*).—Volume 1 contains 36 plates from photographs, showing the root systems at different stages of growth of winter and spring rye, winter and spring wheat, oats, and barley, and volume 2 contains 29 corresponding plates for peas, horse beans, white lupine, red clover, and winter rape. Each volume also contains statistics showing the length and weights of roots, length and weights of tops, and ratios between roots and tops for the individual plants, and a text discussing the work. See also a previous note (E. S. R., 31, p. 733).

The longevity of some common seeds, A. EASTHAM (*Agr. Gaz. Canada*, 1 (1914), No. 7, pp. 544-546).—This paper gives results of germination tests of seeds of timothy, red clover, and alsike clover, that had been stored 10 years, and of oats that had been stored 13 years.

For timothy it is noted that "the average germination of the 25 samples 1 year after harvest was 95 per cent; 5 years after, the average was 90 per cent; after that, however, a steady loss of vitality was shown, although at the end of 10 years an average germination of 54 per cent was still shown. It is interesting to note that, contrary to general opinion, the timothy seed retained its vitality somewhat better than either red clover or alsike."

For red clover "the average germination of 24 samples 1 year after harvest was 97 per cent, while 10 years after, only 44 per cent was capable of germination."

For alsike clover "the average germination of 24 samples 1 year after harvest was 93 per cent, and 10 years after, 45 per cent, or a loss of 48 per cent during that period."

For oats "the average of the 180 samples when first tested in 1903 was 95 per cent, while the average of 156 samples (the supply of seed in 24 samples having become exhausted) when 10 years old was still 95 per cent. Furthermore, the average germination of 53 samples 13 years old was 91 per cent, an average loss of only 4 per cent during that period, a very slight loss when we remember that in ordinary germination work a variation of 5 per cent is allowable between tests on identical lots of seed."

Report of seed analysis, BERTHA A. HOLLISTER (*Ann. Rpt. Sec. Bd. Agr. Mich.* 53 (1914), pp. 168-182, figs. 6).—This gives the results of the purity analyses of agricultural seeds under a new law, and the text of the regulation for seed testing.

First annual seed laboratory report, 1913-14, W. L. OSWALD (*Minnesota Sta. Bul.* 147 (1915), pp. 5-20, figs. 6).—This bulletin discusses the Minnesota seed law and its effect upon the seed industry of the State, points out the functions of the educational, experimental, seed testing, and seed inspection divisions of the seed laboratory, and gives results of seed testing for germination and purity for 1913-14.

Results of seed tests for 1914, F. W. TAYLOR (*New Hampshire Sta. Bul.* 174 (1914), pp. 20, fig. 1).—This gives results of purity and germination tests of 126 samples of seeds examined from September 1, 1913, to September 1, 1914, with brief notes.

Wisconsin seed inspection law, A. L. STONE (*Wisconsin Sta. Circ. Inform.* 4 (1911), 2. ed., pp. 10, fig. 1).—A slightly revised edition (E. S. R., 22, p. 236).

The new seed inspection law, A. L. STONE (*Wisconsin Sta. Circ. Inform.* 4 (1913), Sup., pp. 3).—A brief discussion of the changes made in 1913 in the above law.

HORTICULTURE.

[**Report of horticultural investigations**], **F. GARCIA** (*New Mexico Sta. Rpt.* 1914, pp. 58-67, 72-74, figs. 3).—This comprises brief statements of the progress made with the various horticultural projects in 1913, and in part noted in a previous bulletin (E. S. R., 30, p. 839).

Experiments with Vinifera grapes have shown plainly the benefit derived from covering the vines during the winter. Uncovered vines in both irrigated and nonirrigated plats were badly winter injured, the canes being killed back to the ground. Data are given for 1913 showing the yields on the various grape plats. A table is also given showing the comparative growth made during the season of 1- and 2-year-old apple grafts planted in 1912. The fertilizer experiments with peach trees were continued, and the results as measured by tree growth during 1912 and 1913 are briefly recorded. In the orchard cover crop experiment plantings of various crops were made on October 15 and December 1, 1913, and on January, February, and March 1, 1914. A diagram is given showing the height of these various plantings when plowed under on May 11. Of the various peas planted on October 15, sweet peas alone passed through the winter uninjured and the amount of vine growth in May was equal to that of the various pea plantings made on December 1. Some data are given on cultural and variety tests of spinach and cauliflower.

Breeding experiments with the Mexican chili were continued. A number of promising strains were secured and are here illustrated. Data are given showing the yields of fresh, red, and green chilies, together with the estimated yield per acre of good dried red chilies secured from the various strains in 1913.

Fertilizer tests on onion lands, A. G. B. BOUQUET (*Oregon Sta. Bien. Crop Pest and Hort. Rpt.* 1913-14, pp. 7-24, figs. 4).—The results are given of cooperative fertilizer experiments with onions conducted on a number of farms in the upper Willamette Valley during the seasons 1913 and 1914. The results thus far show in general that expenditures for medium heavy to heavy applications of fertilizer are not always accompanied by resulting crop increase. Each farm is an individual problem and in few cases can a definite rule of fertilization be economically applied to all. The experiments are being continued.

Tomatoes, H. P. STUCKEY (*Georgia Sta. Bul. 112 (1915), pp. 209-248, figs. 14*).—A revision of Bulletin 96 of the station (E. S. R., 26, pp. 640, 648). Historical references and variety tables are either condensed or omitted in the present bulletin and the descriptions of varieties are omitted entirely. Some additional data on tests of early varieties, noted in Bulletin 106 of the station (E. S. R., 31, p. 438), together with directions for the control of insect pests and fungus diseases, have been added to bring the subject matter up to date.

Tomato growing in the South, H. C. THOMPSON (*U. S. Dept. Agr., Farmers' Bul. 642 (1915), pp. 13, figs. 9*).—A popular treatise on tomato culture prepared with special reference to the needs of canning clubs and those who grow tomatoes for home use. It discusses the starting of tomatoes in hotbeds and cold frames, soils and their preparation, manures and fertilizers, planting, cultivation, pruning and staking, rotation, diseases and their control, varieties, cost of growing, yields, and returns.

Greenhouse tomato investigations, A. G. B. BOUQUET (*Oregon Sta. Bien. Crop Pest and Hort. Rpt. 1913-14, pp. 25-34, figs. 3*).—A progress report on the station's investigations with tomatoes (E. S. R., 29, p. 145) in which the results obtained from crops produced during the years 1912-1914, inclusive, are discussed.

The results in general show that tomato varieties differ quite largely in the amount of fruit produced during various stages of the bearing season. In the three years of test Bonny Best, Jewel, Earliana, and Sutton A1 in the order named have been the most desirable varieties from the standpoint of early and prolific production.

Early yields of tomatoes are greatly influenced by pollination. Both hand pollination and shaking the vines resulted in profitable net increases over plants that were left untouched. The total amount of tomatoes for the season is largely decreased where no assistance is given in pollinating the vines.

Actual counts were taken of a large number of flower clusters of various varieties, and it was found that nearly 50 per cent of the blossoms remained unfertilized. The prolific bearing habits of varieties appear to be affected by the number of blossoms ordinarily produced on clusters. Data are given showing the variations in this respect of the varieties tested, together with a general summary of variety characteristics.

Ringling fruit trees, G. H. HOWE (*New York State Sta. Bul. 391 (1914), pp. 575-584, pl. 1*).—In some previous investigations conducted at the station (E. S. R., 19, p. 37) it was found that ringling herbaceous plants was so deleterious to their growth that it could not be advocated for general practice. The object of the experiments here reported was to determine the extent to which fruit trees can be ringed without permanent injury and to what degree the operation induces and stimulates fruitfulness. Apples, pears, plums, and cherries were used in the work which was started in 1910 and carried on during the three succeeding years.

The results as a whole indicate that under certain conditions ringling may induce and possibly increase fruitfulness of apples but it rarely has these favorable effects on other fruits. The practice of ringling stone fruits should never be followed, the experiments indicating almost 100 per cent loss in the life of the trees. Only young and very vigorous apple trees and possibly now and then pear and cherry trees can survive ringling. There are no regular and successive increases in productiveness and ringling had no apparent influence upon the size, color, or maturity of apples. The general effect of ringling on the roots of trees was to increase their size and number and to lessen their vigor. The results obtained are not favorable to ringling fruit trees as a general practice.

Ringling an unsafe stimulus to fruit bearing, F. H. HALL (*New York State Sta. Bul. 391, popular ed. (1914), pp. 4*).—A popular edition of the above.

Spraying farm orchards by the club plan, R. D. JAY and W. M. COOK (*Ohio Sta. Circ. 148 (1914), pp. 45-52*).—This circular describes a cost accounting experiment conducted by the station in cooperation with the Greene County Improvement Association in order to secure data relative to the community spraying of orchards by one man. An itemized account is given of the overhead charges connected with the work, together with an itemized statement of the expense incurred in spraying one orchard and summarized statements of the cost in the seven other orchards.

The total cost per tree for three sprays was 44.3 cts. and the total amount of spray material required per tree for three sprays was 0.7 gal. lime-sulphur and 0.2 lb. lead arsenate. The average number of trees sprayed per hour was 18, including the time spent in mixing the material and filling the tank. Under favorable conditions it was found possible to spray 300 trees in a day. The total rental charges for the spray outfit amounted to \$58.86, which allows 6 per cent on an investment of \$150, as well as 20 per cent depreciation, and leaves about \$18 a year for repairs, insurance, and storage charges.

Some suggestions based on the present work are given with a view to assisting those organizing orchard spraying clubs.

Spraying program for orchards with combinations recommended, W. J. GREEN, A. D. SELBY, and H. A. GOSSARD (*Ohio Sta. Circ. 149 (1915), pp. 53-60*).—This circular contains schedules for spraying orchards of apple, pear, plum, and peach, the directions being based upon many years of observations and experimental testing.

Spray treatment, etc., for orchards, W. E. BRITTON and G. P. CLINTON (*Connecticut State Sta. Bul. 184 (1914), pp. 3-12*).—This bulletin describes the general spraying practice for the treatment of the apple, pear, peach, plum, cherry, and quince, and gives directions for making spray mixtures.

Spray calendar, W. E. BRITTON and G. P. CLINTON (*Connecticut State Sta. Bul. 183 (1915), pp. 32, figs. 63*).—This calendar contains directions for the control of the more important insect pests and diseases of orchard and small fruits, vegetables, and other plants, including also formulas for the preparation of spray mixtures.

Tree fillings and wound dressings for orchard and shade trees, A. D. SELBY (*Ohio Sta. Circ. 150 (1915), pp. 61-63*).—This circular describes the process of filling cavities in branches and trunks with a composition of asphaltum and sawdust, a method originated by J. Boddy. Instructions are also given for dressing wounds with gas tar and liquid asphaltum.

Thinning apples, H. J. EUSTACE (*Michigan Sta. Circ. 24 (1914), pp. 158-160, figs. 2*).—This circular contains practical suggestions relative to thinning apples. Some data are given showing the time required to thin fruits of four Wealthy apple trees. On one tree 2,980 fruits were removed in two hours time. This tree yielded 19 bu. of marketable fruit and 2.5 bu. of culls at harvest time.

An inquiry into the nature of a somatic segregation of characters in the LeConte pear, W. P. TUFTS (*Oregon Sta. Bul. 123 (1914), pp. 4-16, figs. 6*).—The author cites several recorded instances of variation of characters in somatic tissue, and gives the results of a study conducted with the LeConte pear with the view of throwing some light on the general laws underlying somatic variations. The somatic segregation here considered has to do with the relative deciduousness or persistence of calyx lobes in the LeConte pear. Observations were made throughout the fruiting season on the crop of one tree, amounting to 5,396 fruits, each of which was considered as 5 fruits when

determining the deciduous or persistent nature of the calyx lobe. A similar study with 56 fruits of the Transcendent crab apple was also made.

An examination of the data secured with both fruits showed a striking similarity in the segregation of the deciduous and persistent factors to that secured in an F_2 Mendelian hybrid. The deciduous factor dominated in the pear at the ratio of 1:3.7 and in the crab apple at the ratio of 1:2.8. Partial evidence is presented to show that the failure of the segregation in the LeConte pear to assume that of a characteristic F_1 Mendelian hybrid, i. e., the complete dominance of the deciduous factor, may be due to the possibility of either one or both of the supposed parents, *Pyrus sinensis* and *P. communis*, carrying both a factor for deciduousness and a factor for persistence. Out of 250 varieties of supposedly pure *P. communis* studied, 31 per cent sometimes shows a tendency toward deciduous calyx lobes. The author concludes in brief that since the Mendelian ratio is so closely approximated, it is reasonable to consider the LeConte a true hybrid between the species *P. communis* and *P. sinensis*.

Assuming, however, that the LeConte is a mere mutation of *P. sinensis*, "the data show that there is apparently a mechanism possessed by the somatic cell capable of affording practically the same results and with the same degree of regularity as those afforded by the reduction and fertilization processes incident to bisexual reproduction." It is suggested that this hypothesis may explain the immediate causes of at least some bud variations, and the inquiry as a whole is offered as a contribution to our present limited data on bud variation.

A bibliography of the cited literature is given.

The pear as affected by moisture supply, A. F. BARSS (*Oregon Sta. Bien. Crop Pest and Hort. Rpt. 1913-14, pp. 38-49, figs. 4*).—The results for the first two seasons are given of experiments conducted to determine the effect of varying amounts of water upon the growth and fruiting habit of pear trees.

A test was conducted with 48 uniform dwarf Bartlett pear trees growing in pots under controlled conditions. One lot of pots was kept standing in water in order to insure a continuous supply. Another lot of trees received just as much water as was needed to keep up the supply for the first lot, but the water was applied in twice as frequent applications of one-half the quantity each time. The trees in the third lot received half as much water as for the first two lots. The trees of the fourth lot received just enough water to keep them alive.

The results for the first year showed no perceptible difference between the different lots of trees in the time required for the trees to leaf out fully. Trees receiving the maximum amount of water developed larger and more brightly colored leaves than the trees receiving half the amount. Trees given the minimum amount of water developed small, dull, grayish-green leaves. All of the trees started to form terminal buds at the same time, but these buds grew out again on some of the fully watered trees, thus indicating that large increases in the amount of water above the minimum required by the trees lengthen the growing season. Generally speaking, the amount of wood growth increased with the amount of water supplied, although the difference was not great in the two lots receiving the least amount of water. The lenticels of trees receiving the greatest amount of water were larger and more conspicuous and the growing wood showed more green than on the trees receiving half the amount. When matured and dormant, the wood on the trees receiving the full amount of water was darker and showed less green than the wood on the trees receiving half the amount of water. Late growths put out by the trees receiving the continuous supply of water remained green through the winter.

During the second season measurements and observations were made at frequent intervals to determine any existing differences in condition of trees, in

blooming, fruit development, new branch growth, foliage, etc. The differences observed are here presented and discussed. As summarized they show that thus far for the two years of experiment the water supply did not influence the time of starting of buds. The trees which received an excess of water showed the greatest number of blossom clusters; greatest average size, greatest average weight, and highest quality of fruit; greatest total amount of wood growth; greatest number of branches; greatest average linear growth to the branch; greatest average diameter of wood growth; longest internodal spaces; greatest number of cases of multiple growths from single buds; largest, most conspicuous, and greatest number of lenticels; greatest size, weight, and vigor of leaves; greatest number of leaves affected with the apparent "sunburn"; longest growing season; largest, healthiest, and most vigorous buds; and readiest formation of callus tissue. The moderately watered trees had the largest total number of blossoms and greatest number of fruits. The scantily watered trees led the others only in having the largest average number of flowers to the cluster. "Of the lots which received the excess of water, the one which received water less frequently showed a superiority only in that it had the greater number of fruits, greater average weight to the leaf, and greater average diameter of new growth. On the other hand, the lot watered more frequently slightly exceeded the other in all other respects."

Blackberry culture. G. M. DARROW (*U. S. Dept. Agr., Farmers' Bul. 643 (1915), pp. 13, figs. 8*).—A practical treatise on blackberry culture, discussing the location of the plantation, soils and their preparation, propagation, pollination, planting, intercrops, cultivation, fertilizers, systems of training, mulching, harvesting, yields, winter protection, duration of plantation, insects and diseases, regional adaptability of varieties, hybrids and novelties, and blackberry by-products. In the introduction statistics are given showing the acreage devoted to the cultivation of blackberries and dewberries in the United States in 1909.

Strawberry varieties in Oregon. V. R. GARDNER (*Oregon Sta. Bien. Crop Pest and Hort. Rpt. 1913-14, pp. 50-94, fig. 1*).—This comprises descriptive notes on varieties of strawberries which have been tested at the station during the period 1908 to 1913, inclusive. The characters described are such as have to do with the horticultural value of both plant and fruit. Reference is made to the history of each variety as far as known. A bibliography of cited references is appended.

FORESTRY.

The temperature of leaves of *Pinus* in winter. J. H. EHLERS (*Amer. Jour. Bot., 2 (1915), No. 1, pp. 32-70, figs. 4*).—Results are given of an investigation conducted in the arboretum of the University of Michigan with the view of determining the internal temperature of pine leaves in winter under as nearly natural conditions as possible. The species *Pinus laricio austriaca* was selected for the purpose, the leaves of this species being the largest in cross section of the conifer leaves available in the locality. An attempt was also made to obtain direct evidence of photosynthesis under winter conditions by examining for starch content the leaves of the various conifers growing in the university arboretum.

The data here presented show that evergreen conifer leaves even under winter conditions maintain through the absorption of radiant energy temperatures from 2 to 10° C. higher than the surrounding air. The maximum obtained under brilliant illumination and with a light breeze blowing was 8.83°. Where the leaf

was partially protected against air currents a differential temperature of 10.31° was obtained. Even diffuse light according to its brightness will increase the leaf temperature from 0.5 to 2° . The average differential temperature for February, the coldest month of the year, based on some 650 readings taken between the hours of 8 a. m. and 3 p. m. was 3.06° .

Although these differential temperatures are considerably less than those obtained by previous investigators for broad leaves under summer and tropical insolation the differences are believed to be of sufficient magnitude to become an important factor in photosynthesis. More or less starch was found in various conifers examined during the winter although no conclusive evidence of starch formation was observed after December 13. This result, it is suggested, merely indicates that photosynthesis was not sufficiently active under the conditions that obtained during January and February to result in the production of starch in the leaf. Carbohydrates may have been formed and used or translocated as fast as formed.

The literature of the subject is reviewed under the general headings of the internal temperature of foliage leaves, photosynthesis and low temperatures, and accumulation of reserve food material by evergreen trees in winter.

A bibliography of consulted literature is appended.

Report on forest administration in Burma for the year 1912-13, C. G. ROGERS (*Rpt. Forest Admin. Burma, 1912-13, pp. III+4+149*).—A progress report on the administration of the state forests in Burma, including a financial statement for the year 1912-13. The important data relative to alterations in forest areas, forest surveys, working plans, forest protection, silvicultural operations, miscellaneous work, yields in major and minor forest products, revenues, expenditures, etc., are appended in tabular form.

Annual progress report on forest administration in the Presidency of Bengal for the year 1912-13, C. E. MURIEL (*Ann. Rpt. Forest Admin. Bengal, 1912-13, pp. II+45+4, pl. 1*).—A report similar to the above relative to the administration of the state forests of Bengal for the year 1912-13.

Progress report on forest administration in the Northwest Frontier Province for 1913-14, W. MAYES (*Rpt. Forest Admin. Northwest Frontier Prov., 1913-14, pp. 2+II+16+XXVI*).—A report similar to the above relative to the administration of the state forests of the Northwest Frontier Province for the year 1913-14.

DISEASES OF PLANTS.

How saprophytic fungi may become parasites, G. MASSEE (*Roy. Bot. Gard. Kew, Bul. Misc. Inform. No. 5 (1914), pp. 190, 191*).—A case is described in which *Clerodendron fallax* at Kew had been attacked by *Cladosporium epiphyllum* under conditions favorable thereto. This had apparently started as a saprophyte on the stalked peltate leaf glands excreting a nutritive liquid, and appeared to have developed the parasitic habit within three weeks. It is thought that opportunities for habitually saprophytic but potentially parasitic fungi to change their habit are numerous in nature, very slight changes of conditions being sufficient to initiate the parasitic activity.

Parasitism in *Hymenochaete agglutinans*, A. H. GRAVES (*Mycologia, 6 (1914), No. 6, pp. 279-284, pl. 1*).—This fungus is stated to be a facultative parasite, having been found encircling, attacking, and killing *Benzoin æstivale* in contact with *Alnus incana*, which also it had apparently killed. It is thought that the choking and consequent weakening effect of the encircling fungus may have had something to do with its increase of activity in the host. This is evidenced by the progressive diminution of growth of the latter above

the original point of attack (the parts below showing an increase of growth) during three years. A young red maple was also found to have been attacked in like manner and to have been killed above the point of contact.

Eelworm disease (*Agr. Gaz. Tasmania*, 22 (1914), No. 9, p. 347).—It is stated that the nematodes which infest clover also attack oats and several other cultivated besides many wild plants. They are carried on tools, wheels of vehicles, etc., as well as by animals, the eggs resisting desiccation for a long time.

It is claimed that turning the land as much as 5 in. deep destroys the nematodes, also that potassium sulphate applied to the land shortly before sowing the clover seed is safely protective to the plant during the short period of its susceptibility to nematode attack.

Maryland plant diseases in 1912, J. B. S. NORTON (*Rpt. Md. State Hort. Soc.*, 15 (1912), pp. 182-188).—After discussing the immediate and later effects of the very cold weather on plants in 1912 and stating that the cool moist summer was favorable to parasitic disease in Maryland, the author lists alphabetically about 50 plants with parasites observed in connection with each.

Report of the botanist, E. A. BESSEY (*Michigan Sta. Rpt. 1914*, pp. 226, 227).—Besides brief notes of work regarding some plant diseases, more special mention is made of investigations by J. A. McClintock on Michigan ginseng troubles, particularly those due to nematodes. Golden seal was found susceptible to this pest.

The steam pan method of sterilization was found to give adequate protection against nematodes. A soil drench of formalin, 1 part to 100, prevented damping off in the beds, and black rot was controlled by a much higher concentration of this agent.

[**Report on work in plant pathology**] (*New Mexico Sta. Rpt. 1914*, pp. 80, 81).—The principal work carried on in the department of plant pathology has been the studies of the blighting of chili peppers, chlorosis of foliage of orchard trees, studies of diseases of apples, pears, and peaches, particularly the powdery mildew of the apple (*Podosphæra oxycanthæ*), and some truck crop diseases, one of which, *Fusarium wilt*, is said to cause considerable damage to tomato crops.

The blight of peppers is thought to be influenced by damp weather, as the disease spreads much more rapidly under such conditions than where the season is dry and free from heavy rains. So far no causative organism has been isolated.

In the studies on chlorosis of the foliage of orchard trees, plugging and spraying them with 1 per cent solution of ferrous sulphate were compared. The use of the material as a spray was found to benefit the trees greatly.

Notes, observations and minor investigations on plant diseases, H. S. JACKSON (*Oregon Sta. Bien. Crop Pest and Hort. Rpt. 1913-14*, pp. 261-283, figs. 15).—Notes are given of observations and investigations on a considerable number of diseases of economic plants due to fungi, etc.

Fungus diseases of Swedish melons and cucumbers, J. ERIKSSON (*K. Landtbr. Akad. Handl. och Tidskr.*, 52 (1913), No. 4, pp. 233-253, figs. 9; *Meddel. Centralanst. Försökv. Jordbruksområdet*, No. 76 (1913), pp. 23, figs. 9).—The following fungi causing diseases are described and discussed in the paper: *Cladosporium cucumerinum*, *Cercospora melonis*, and *Colletotrichum lagenarium*.

A contribution to the study of foot rot of cereals, P. BERTHAULT (*Rev. Gén. Bot.*, 25 bis (1914), pp. 29-34).—Reviewing reports and discussions of studies on this disease of cereals, and reporting on his own examination of diseased wheat stems sent in from several portions of France during 1913, the author states that while he did not find *Leptosphaeria herpotrichoides* on these speci-

mens, *Ophiobolus graminis* was abundant. *Fusarium rubiginosum*, it is claimed, is almost constantly present in this disease. It is thought that foot rot of cereals may be considered due to the attack of such fungi as *Ophiobolus* and *Leptosphaeria* on the one hand and to various species of *Fusarium* on the other. Some discussion of the fructification of these fungi is also given.

Rust in the interior of graminaceous seeds, J. BEAUVÉRIE (*Rev. Gén. Bot.*, 25 bis (1914), pp. 11-27, figs. 10).—In continuation of work previously reported (*E. S. R.*, 30, p. 241), the author states that within the seed coats of several wild or cultivated grains he has found the fruiting bodies and the mycelium of rusts. This occurrence is very frequent in certain species, as *Puccinia glumarum* in barley, and other rusts in *Agropyron* spp., *Brachypodium pinnatum*, etc. *P. graminis* is sometimes found in this relation on wheat.

Fungus diseases of cotton, L. SMITH (*Rpt. Agr. Expt. Sta. St. Croix*, 1912-13, pp. 59, 60).—It is stated that while the usual attacks of angular leaf spot, round spot, rust, and mildew of cotton are observed to do but little harm here, a much more serious case is that caused by a fungus which attacks young bolls almost to the time of their maturity. The trouble is thought to be due to a *Macrosporium*, possibly *M. nigricantium*, which is said to be associated with black rust of cotton in the United States.

A disease causing a blistered and torn appearance of young leaves and abortion and blackening of young flower buds is thought to be practically identical with that described by Cook (*E. S. R.*, 29, p. 47) as causing a physiological disorder of cotton in the United States, differences in details as to manifestations being ascribed to differences in local conditions.

Spraying of peanuts for leaf rust (*Agr. News [Barbados]*, 13 (1914), No. 328, p. 380).—Bordeaux mixture sprayed on twice (63 and 77 days after planting) under 80 lbs. pressure is considered to have given an increase of 42 per cent in the sprayed as compared with the unsprayed plot in the case of the Gambia variety of peanuts affected with *Uredo arachidis*.

Notes on miscellaneous potato diseases, F. D. BAILEY (*Oregon Sta. Bien. Crop Pest and Hort. Rpt. 1913-14*, pp. 245-256, figs. 9).—Notes are given on investigations of various potato diseases in Oregon. Among these are several storage rots, the powdery dry rot due to *Fusarium trichothecioides*, dry rot due to *F. caeruleum*, and jelly-end rot caused by *F. orthoceras*. Notes are also given on silver scurf, early blight, *Verticillium* wilt, mushroom root rot, and *Rhizoctonia violacea*, with suggestions for their control.

Brief accounts are also presented on the curly dwarf and internal browning of tubers due to nonparasitic causes.

Potato spraying experiments, F. D. BAILEY (*Oregon Sta. Bien. Crop Pest and Hort. Rpt. 1913-14*, pp. 257-260, fig. 1).—Accounts are given of spraying experiments for the control of late blight of potatoes, which is said to be occasionally a serious menace in the western part of the State.

The results of the use of Bordeaux mixture and arsenate of lead for the control of this disease and insect pests show in one instance an increased yield of 44.4 per cent where no late blight was present. Experiments for two years in another locality showed that the late blight could be effectively controlled by Bordeaux mixture. When blight appeared a month before harvest, the yield was increased in one case 46 bu. per acre and in another 203 bu. when the plants were sprayed.

Leaf roll of potato, VIII, G. KÖCK, K. KORNAUTH, and O. BROŽ (*Ztschr. Landw. Versuchsw. Österr.*, 17 (1914), No. 5, pp. 270-300).—This continues recent reports on the study of potato leaf roll by the committee, as noted by these authors (*E. S. R.*, 30, p. 243) and by Reitmair (*E. S. R.*, 30, p. 48).

It is stated that this disease is associated with species of *Fusarium* in southern, and of *Verticillium* in northern, regions. The primary infection takes place from the soil, which, it is thought, may retain the fungus in an active condition for at least five years. Tubers from shoots not attacked on diseased plants will be sound, while those from infected shoots may be more or less permeated by the mycelium or may be simply weakened by its presence in the vascular system of the stolon. From an infected seed tuber the mycelium may (though apparently it seldom does) grow into the forming shoots (secondary infection), or the seed tuber may give rise to descendants which are simply weakened as an after-result of the disease. Resistance as regards varieties differs greatly, but no completely immune varieties are mentioned.

Control measures recommended include suspension of potato culture for at least five years on fields which have shown leaf roll; careful selection of seed, with particular reference to climate and soil; suitable fertilization of the soil to increase vigor in the crop; and careful elimination of plants showing leaf roll during growth.

A bibliography of contributions for 1913 is added.

Occurrence of silver scurf of potatoes in the Salt Lake Valley, Utah, P. J. O'GARA (*Science, n. ser., 41* (1915), No. 1047, pp. 131, 132).—The author calls attention to the occurrence of silver scurf (*Spondylocladium atrovirens*) on potatoes in the Salt Lake Valley, Utah. From the investigation of the source from which the seed tubers were purchased, it is believed that this disease is widespread among the intermountain States, particularly in Utah and Idaho.

An endophytic endodermal fungus in *Solanum tuberosum*, E. M. WILCOX, G. K. K. LINK, and FLORENCE A. MCCORMICK (*Abs. in Science, n. ser., 41* (1915), No. 1048, p. 171).—A preliminary account is given of investigations on an endophytic fungus found in *S. tuberosum*. This fungus, it is said, may be found throughout the whole plant, but is confined to the endodermis. In the usual vegetative propagation of the potato it proceeds from the tuber throughout the shoots to the daughter tubers. The possible relation of this fungus to tuberization is discussed.

[Diseases of sugar cane on the island of St. Croix, 1913], L. SMITH (*Rpt. Agr. Expt. Sta. St. Croix, 1912-13, pp. 45, 46*).—*Marasmius sacchari* is said to cause considerable damage to sugar cane all over the island. Fructifications have been reported from one plantation.

The chief remedies recommended include planting tops from land known to have been free from the disease for 8 or 10 years, the employment of Bordeaux mixture for soaking the cane tops 20 minutes before planting, and rotation, preferably with cotton followed by legumes or these with corn.

Red rot of the leaf sheath, which does some damage here, has been identified, it is said, with a fungus disease which is common in Java.

Effect of dilution upon the infectivity of the virus of the mosaic disease of tobacco, H. A. ALLARD (*U. S. Dept. Agr., Jour. Agr. Research, 3* (1915), No. 4, pp. 295-299).—Experiments are reported that were conducted with the idea of determining the effect of dilution upon the infective power of the virus of the mosaic disease of tobacco. A quantity of expressed sap from diseased leaves was passed through filter paper and all dilutions accurately determined, and inoculations immediately made from these to young vigorous tobacco plants growing in a greenhouse.

It was found that the virus of the mosaic disease, when diluted to 1 part in 1,000 of water, is quite as effective in producing infection as the original undiluted virus. It was observed that attenuation of the virus was indicated when dilutions of 1 part in 10,000 were made. At greater dilutions infection is not considered likely to occur. The author claims that the evidence at hand indi-

cates that there is something present in the virus of mosaic disease which is extraneous to the protoplasmic organization of healthy plants, and, in his opinion, parasitism offers by far the simplest and most reasonable explanation of its origin.

A fruit spot of tomato, R. PEROTTI and U. CRISTOFOLETTI (*Staz. Sper. Agr. Ital.*, 47 (1914), No. 3, pp. 169-216, pls. 3, figs. 9).—Reporting a study of the fruit rot said to be peculiar to a small, pear shaped variety of tomato, the author states that this rot is associated with the presence of the fungus *Cladosporium herbarum* and of a bacterium described as a new species, *Pseudomonas poly-cromigena*, the latter being nonparasitic and apparently dependent upon the diminution of acidity in the fruit by its associated fungus.

Frequently the same spots show also the presence of another fungus, considered also as parasitic and described as a new variety, *Oospora (Oidium) lactis solani*. It is thought that *C. herbarum* is hindered by the presence of the other organisms, also that since not over 5 to 10 per cent of the fruits are attacked by *C. herbarum*, the development of a more resistant variety need not be very difficult.

Fruit pit studies in the Willamette Valley, C. I. LEWIS (*Oregon Sta. Bien. Crop Pest and Hort. Rpt. 1913-14*, pp. 35-37, fig. 1).—The author reports three years' work conducted on a study of the fruit pit in the Willamette Valley, the disease being locally known under a number of names.

It is believed that the trouble may be due to some physiological disturbance, no definite cause having been determined for it. The general appearance of fruit affected by this trouble is indicated by spots, which may be only on the surface, and finally cause a depression in the skin, or the pits may not show on the outside, but be scattered throughout the flesh. Occasionally the trouble takes the form of a dry rot around the core.

The effect of various fertilizers on controlling this disease was investigated without conclusive results. The author comments on the effect of cold storage in retarding the disease.

Apple rust and die-back, H. M. NICHOLLS (*Agr. Gaz. Tasmania*, 22 (1914), No. 9, pp. 351-360, figs. 6).—It is claimed that apple rust, cracking, die-back, and leaf spot, besides possibly other disorders of more or less obscure character, are due to the presence and activity of the fungus *Coniothecium chomatosporium* in some of its several stages or forms, which are briefly discussed.

It is stated that the activity of this fungus is favored by exposure to strong light, also by use of Bordeaux mixture, and that it is carried over winter largely on dead leaves, and spread probably by omitting to disinfect pruning tools between trees. Poor drainage also, it seems, may sometimes play a part, as may any condition tending to check normal growth of the trees.

No fungicidal preparations yet tested have proved entirely successful and safe.

Cedar rust on the apple, W. M. SCOTT (*Rpt. Md. State Hort. Soc.*, 15 (1912), pp. 91-105).—This is a report with discussion on recent experience with apple rust, ascribed mainly to *Gymnosporangium macropus*, though it is thought to be producible also by *G. globosum* and *G. clavipes*.

Destruction of all cedars in the locality is the remedy most favored. When this is not practicable the use of such a fungicide as lime sulphur is found helpful. This is to be applied just before the blossoms open, again as soon as the petals fall, and twice later at intervals of about 10 days. There is also a discussion of resistant apple varieties.

Bacterial gummosis or bacterial canker of cherries, H. P. BARSS (*Oregon Sta. Bien. Crop Pest and Hort. Rpt. 1913-14*, pp. 224-240, figs. 7).—A progress report is given of an investigation previously noted (*E. S. R.*, 29, p. 154).

The bacteria causing the disease have been isolated and artificial inoculations made which indicate that they are the cause of the trouble in question. Some varieties were found to be naturally immune, and the planting of such is advised. There appear to be two slightly different kinds of bacteria concerned in this trouble, and in addition to blighted buds and spurs, cankers are formed on the branches, limbs, and trunks of trees.

The method of dissemination of the trouble is unknown, but indications point to the possibility of sucking insects being among the carriers of the bacteria. The most serious infection is believed to take place in the autumn, the new infection developing slowly at first, and late in winter and early in spring becoming of very rapid growth. Wound parasites and wood rotting fungi frequently enter at the cankered spots and extend the injury originally caused by the bacteria.

A similar canker disease has been found on prunes, peaches, and apricots, and pathogenic bacteria apparently identical with the organisms found on cherry trees were isolated.

Suggestions are given for the control of the disease, which include the planting of resistant stocks to be later grafted to commercial varieties, and cutting out of all diseased material.

Experimental spraying of prunes for control of brown rot, F. D. BAILEY (*Oregon Sta. Bien. Crop Pest and Hort. Rpt. 1913-14, pp. 241-244*).—The results of spraying experiments carried on in 1913 and 1914 for the control of the brown rot of stone fruits are given.

In 1913 four spray mixtures were tested, Bordeaux mixture, Burgundy mixture, self-boiled lime sulphur, and commercial lime sulphur. Two applications were given of all except the Burgundy mixture. The results seemed to indicate that for the earlier attack Bordeaux mixture gave the best results, while the second record showed a greater loss than with the check in all cases except where self-boiled lime sulphur was employed.

In 1914 the work was repeated, and comparing the results obtained both seasons it is considered probable that Bordeaux mixture will be found as satisfactory as any spray for the control of this disease. The best time of application of the fungicides was found to vary with conditions that are not clearly understood.

A Pacific Coast rust attacking pear, quince, etc., H. S. JACKSON (*Oregon Sta. Bien. Crop Pest and Hort. Rpt. 1913-14, pp. 204-212, figs. 3*).—This is a detailed account of the attack of *Gymnosporangium blasdaleanum* on quinces, pears, etc., a preliminary notice of which has already been given (*E. S. R.*, 32, p. 51).

A bibliography is given.

Varietal resistance of the gooseberry against mildew and the effects of sulphur treatment therefor, G. KÖCK (*Ztschr. Landw. Versuchsw. Österr.*, 17 (1914), No. 6-7, pp. 634-637).—Of about 100 varieties of gooseberry tested, about 16 proved to be susceptible to American gooseberry mildew, while 56 proved to be susceptible to injury from treatment with powdered sulphur for the prevention of the disease.

Fungus diseases of coffee in Porto Rico, G. L. FAWCETT (*Porto Rico Sta. Bul.* 17 (1915), pp. 29, pls. 8).—A discussion is given of the commoner and more destructive diseases of coffee in Porto Rico, among which are the leaf rot or thread blight due to *Pellicularia koleroga*, the leaf spot caused by *Stilbella flavida*, root diseases due to *Rosellinia* sp. and *Dematophora* sp., and berry spot caused by *Cercospora coffeicola*. These diseases are described at considerable length and the results of investigations for their control are given.

In addition to the above, notes are given on leaf spot due to *Cephalosporium* sp., a root and trunk disease associated with the presence of *Fusarium* sp., and the attack of nematodes (*Heterodera radiculicola*).

For the leaf rot no satisfactory method of control has been found, although spraying with Bordeaux mixture will lessen the disease to a considerable extent. For the leaf spot Bordeaux mixture is usually found quite effective if thoroughly applied. For the control of the spot on berries the author recommends providing adequate shade, as this not only renders the action of the fungus less harmful, but also improve the quality of the coffee. For the root diseases ditching about the trees, together with the use of unslaked lime, sulphur, or other substances about them is recommended.

Black root disease of limes (*Agr. News [Barbados]*, 13 (1914), No. 327, pp. 364, 365).—This is the mycologist's report, continuing observations of South (E. S. R., 26, p. 245; 28, p. 149), on *Rosellinia bunodes* attacking lime trees in Dominica.

This important disease is said to be different from one somewhat similar on cacao. It appears only on estates with fairly recent forest clearings, apparently preferring trees growing under very good conditions. New roots which often appear above the wound on the collar may remain healthy for a time and lead to partial recovery of the tree. The fungus remains active on roots and branches in the soil, attacking new roots and following these to the collar, and extending up the tree if dampness and shade are abundant.

Spores of two forms occur on the above-ground portions (the later form being the more resistant), but it is thought that infection usually occurs by contact of live portions with dead roots bearing the fungus.

The wet weather of the year is thought to account in part only for the seriousness of the situation, the natural spread of the roots playing an important part.

Remedial measures suggested include the use of carbon bisulphid emulsion as advocated by Bordaz (E. S. R., 31, p. 549), isolation by means of trenches, ventilation, destruction by fire of all affected wood, and budding on sour orange, which is said to be immune to this fungus.

Black knot of birch, G. MASSEE (*Roy. Bot. Gard. Kew, Bul. Misc. Inform.* No. 9 (1914), pp. 322, 323, fig. 1).—It is stated that *Plowrightia virgultorum* is the cause of a disease found on birch trees in parts of Scotland, England, Sweden, Switzerland, Finland, and Germany. The disease is described in its several stages.

Removal of infected branches is the only remedy suggested.

The relationship of *Endothia parasitica* and related species to the tannin content of the host plants, M. T. COOK and G. W. WILSON (*Abs. in Science, n. ser.*, 41 (1915), No. 1048, pp. 171, 172).—Two strains of *E. parasitica* (one American and the other Chinese), *E. radicalis*, and *E. radicalis mississippiensis* were grown in culture media to which different percentages of commercial tannin and special extracts were added.

The results of the experiments indicate that the commercial tannins are variable and probably not pure tannin; that ordinary commercial tannin and pure tannin extracts are not the same; and that the form or quantity of tannin or tannin-like substances with which the fungus comes in contact in the host plant is not known. The food supply influences the vigor of the fungus and its power of resistance. High percentages of tannin usually cause a retardation of germination, frequently followed by an abnormal growth of aerial mycelium. *E. radicalis mississippiensis* was found most resistant, *E. parasitica* second, and *E. radicalis* third, and the American strain of *E. parasitica* was more resistant than the Chinese strain.

E. parasitica may feed to some extent on tannin. Specially prepared pure tannin extracts were less toxic to the fungus than the commercial tannin. Coloring materials which are usually estimated as tannins were toxic. Tannic acid is toxic to many parasitic fungi, but there are other compounds associated with it that are more toxic and may be more important in the economy of the host plant.

A new filbert disease in Oregon, H. P. BARSS (*Oregon Sta. Bien. Crop Pest and Hort. Rpt. 1913-14, pp. 213-223, figs. 9*).—A description is given of a serious filbert disease, which is said to be prevalent in western Oregon, that is characterized by the blighting of the buds and new shoots, spotting of the leaves, girdling and breaking down of smaller branches, and the formation of cankers on the larger branches and trunks. Bacteria have been associated with this disease, but while they are believed to cause it inoculation experiments have not completely demonstrated the relation that they bear to the trouble. Certain varieties of filberts were found more resistant to the disease than others, and for prevention and control the author recommends the growing of filberts in tree form, selecting resistant varieties, and spraying throughout the spring to reduce the number of infections.

Report on cultures with foliaceous species of *Peridermium* on pine made in 1914, G. G. HEDGECOCK and W. H. LONG (*Abs. in Science, n. ser., 41 (1915), No. 1048, p. 171*).—A summary is given of experiments with *P. acicolum*, *P. carneum*, *P. delicatulum*, *P. inconspicuum*, *P. intermedium*, and *P. montanum*, all taken from species of pine. A total of 712 inoculations were made with these species, and with the species of *Coleosporium* with which they were associated as alternate forms.

The results of the experiments indicate that at least four of these species and the related species of *Coleosporium* belong to a single polymorphic species, and that the transfer from one herbaceous host to another is accomplished through the æcial forms in the pines.

Injury by disinfectants to seeds and roots in sandy soils, C. HARTLEY (*U. S. Dept. Agr. Bul. 169 (1915), pp. 35, pl. 1, figs. 2*).—The results of several seasons' investigations on the control of damping-off of pine seedlings are given, a preliminary report of which has already been noted (*E. S. R., 31, p. 647*).

The author found that sulphuric, hydrochloric, and nitric acids, and copper sulphate used in disinfection of seed-bed soil caused injury to the roots of pine seedlings and prevented the development of many species of weeds. Many of the injured seedlings later resumed root growth and recovered. The injury is considered due to the concentration of the disinfectant in the surface soil, due to the capillary rise of the soil solution and the evaporation of water from the soil surface.

It was found in a sandy soil that all injury could be prevented by frequent watering during a germinating period. It could also be prevented by an addition of lime shortly after treating the soil with disinfectant. The use of lime, while undesirable in the case of growing pine seedlings, is believed to be the only way in which injury to angiospermous seedlings can be prevented. Acids also, it was found, could be applied to seed beds at the time of sowing without injury to dormant pine seed. Formaldehyde and corrosive sublimate solution in sufficient strength for disinfection should be used several days before sowing the seed, as they are liable to kill dormant pine seed in the soil. Formaldehyde applied at or before seed sowing was never found to cause the injury to germinating pine seed that was caused by acids and salts,

ECONOMIC ZOOLOGY—ENTOMOLOGY.

Extermination of ground squirrels, gophers, and prairie dogs in North Dakota, W. B. BELL and S. E. PIPER (*North Dakota Sta. Circ. 4* (1915), pp. 11, figs. 6).—It is estimated that the annual loss to farmers in North Dakota from the depredations of six species of rodents amounts to more than a million dollars, and in dry years this loss is probably more than doubled. The Richardson ground squirrel or flickertail, commonly called "gopher" in the State, is the most conspicuous offender.

In January, 1914, an investigation was started by the station in cooperation with the Biological Survey of this Department, the field work commencing early in April and continuing into September. It was found that the Richardson ground squirrel, like the California ground squirrel, is killed more readily by strychnin absorbed through the cheek pouches from properly prepared strychnin-coated grain than through the stomach, only one-fifth as much poison being required to kill when thus taken directly into the circulation. The authors give directions for the preparation of a formula which has given excellent results in exterminating the Richardson ground squirrel, and state that it is equally as effective in destroying the Franklin or gray ground squirrel and the striped or thirteen-lined ground squirrel. In tests made the average cost of treating 1,528 burrows in 135 acres, including poison, grain, and labor, was slightly over 2½ cts. per acre.

Methods of destroying prairie dogs and pocket gophers are also briefly described.

Preliminary census of birds of the United States, W. W. COOKE (*U. S. Dept. Agr. Bul. 187* (1915), pp. 11, fig. 1).—This is a report of work carried on during the summer of 1914 for the purpose of ascertaining approximately the number and relative abundance of the different species of birds occurring in this country. Such information has been found necessary in administering the federal law relating to the protection of migratory game and insectivorous birds as a basis for determining the adequacy of the protection now afforded them. Nearly 200 reports were received from observers, mainly from the section of the United States north of North Carolina and east of Kansas.

"The census covered 58 of the 108 acres of the average farm of the Northeastern States and revealed on this area a bird population of 69 nesting pairs, and on the remaining 50 acres it is estimated that there would be about one pair to the acre; in all, 114 nesting pairs to the 108 acres of farmed land. On the 46 acres of wild land existing for each 108 acres of farmed land it is safe to assume that there would be fewer birds than on the census-covered area.

"The results of the census show that the numbers of birds are too few, and it is believed that with adequate protection and encouragement they can be materially increased. The record for density comes from Chevy Chase, Md., where 161 pairs of 34 species were found nesting on 23 acres.

"This preliminary census shows that the most abundant bird on farms of the Northeastern States is the robin; that the next is the English sparrow; and that following these are the catbird, the brown thrasher, the house wren, the kingbird, and the bluebird in the order named."

Some common birds useful to the farmer, F. E. L. BEAL (*U. S. Dept. Agr., Farmers' Bul. 630* (1915), pp. 27, figs. 23).—Brief popular accounts of the more important birds of the farm, particularly as relates to their food habits.

Food of the robins and bluebirds of the United States, F. E. L. BEAL (*U. S. Dept. Agr. Bul. 171* (1915), pp. 31, figs. 2).—This bulletin presents in detail the results of investigations of the food of five species of American robins and blue-

birds. The species of insects and other animal and vegetable substances taken from the stomachs of a large number of individuals have been identified and are listed for each of these species.

Summarizing the results of studies of the common robin (*Planesticus migratorius* and subspecies), the author concludes that while in all probability it is to-day doing much more good than harm it must be acknowledged that the bird is potentially harmful since its diet contains a large percentage of fruit, including many varieties. Investigations of the varied thrush, or Oregon robin (*Ixoreus naevius* and subspecies) indicate that it is not likely to do much mischief by eating useful insects since a good proportion of its animal food consists of such as are of no economic significance. Since this bird does not at present spend the breeding season in a well settled and cultivated country farm products are not fed upon. The eastern bluebird (*Sialia sialis* and subspecies) does not prey upon any product of husbandry or in any way render itself injurious or annoying. During the spring and early summer when small fruits are at their best it subsists on insects to the extent of five-sixths of its food, and during the late fall and early spring when insects are scarce only waste fruit is available. The western bluebird (*S. mexicana* subspecies) is found to be an eminently useful species. The mountain bluebird (*S. currucoides*) has probably not yet come in contact with the products of husbandry extensively enough to demonstrate its real propensities, but the nature of its food does not indicate that there is much to be feared from it.

Quassia as a contact insecticide, W. B. PARKER (*U. S. Dept. Agr. Bul. 165* (1914), pp. 8, fig. 1).—Quassia wood (*Picrasma excelsa*), a native of Jamaica that is available in considerable quantities, has for many years been employed in the preparation of spray solutions for the control of the hop aphid (*Phorodon humuli*). The percentage present of quassia, the active principal in the chips, varies somewhat and does not appear to be definitely known. If the percentage be 0.75, as given by one author, in order to use it at an effective rate of 0.4 gm. to 2,000 cc., only 1.5 lbs. of chips to 100 gal. of spray would be required. The author states that if twice the amount of chips calculated to be necessary were used, in order to be on the safe side, and 3 lbs. of whale-oil soap added, the cost of material for 100 gal. of the spray would amount to but 24 cts.

In an attempt to determine its insecticidal value the author compared the action of quassia with that of a standard contact insecticide, namely, nicotine sulphate solution, standardized to 40 per cent, and used at the rate of 1:2,000. Since whale-oil soap even at the greatest dilution at which it has any spreading effect was found to kill a certain percentage of aphids, a soap bark solution was used at the rate of 2 lbs. to 100 gal. of water. In conducting the experiments prune twigs infested by the hop aphid (*P. humuli*) and the prune aphid (*Hyalopterus pruni*) were brought from the field and after being sprayed with the solutions were set in moist sand. The results presented in tabular form show that "quassia used at the rate of 0.4 gm. to 2,000 cc., or 6.5 oz. of 40 per cent solution to 100 gal., was almost as effective against the hop aphid and the prune aphid as nicotine sulphate, 0.4 gm. to 2,000 cc. The difference is approximately 3 per cent, while quassia, 0.4 gm. to 1,000 cc., is fully as effective."

The author is of the opinion that quassia has possibilities as a commercial insecticide and that it can be cheaply prepared and profitably sold at a lower price than some of the materials that are now on the market. It is pointed out, however, that the experiments were conducted under conditions existing at Sacramento, Cal., and that the efficacy of this insecticide should be determined also for a more humid climate before a commercial recommendation is made.

Para-dichlorobenzene as an insect fumigant, A. B. DUCKETT (*U. S. Dept. Agr. Bul. 167 (1915), pp. 7, pls. 2*).—Para-dichlorobenzene is a colorless, crystalline substance that volatilizes very readily as a colorless vapor with a peculiar ether-like odor, and which has been known for many years but only recently used as an insecticide. The vapor is harmless to man and domestic animals under ordinary conditions, but in many instances it is a specific poison for insects. The greatest advantages which it possesses are absolute noninflammability and its comparatively low cost, and the disappearance of the ether-like smell upon exposure of the fumigated substances to the open air. It is stated that it can be used in closed or occasionally opened cupboards and even in sitting rooms without causing any inconvenience whatsoever. Fumigation experiments with stored product insects conducted during the spring of 1914, here reported in tabular form, show it to have destroyed all of ten species of beetles exposed when used at the rate of 2 lbs. to 100 cu. ft. of space at a warm temperature but only 70 per cent were killed when exposed at a low temperature. Flies and aphidids were destroyed when it was used at the rate of 8 oz. to 100 cu. ft. of space.

The author concludes from the observations and experiments that para-dichlorobenzene is an excellent fumigant against stored product insects, case-bearing clothes moths, roaches and ants, museum pests, and miscellaneous house insects. It is also an effective substitute for potassium cyanid in collecting bottles.

An account of the chemical and physical properties of this chemical, prepared by the Insecticide and Fungicide Laboratory, is appended.

A method of fumigating seed, E. R. SASSCER and L. A. HAWKINS (*U. S. Dept. Agr. Bul. 186 (1915), pp. 6, figs. 2*).—The need of a reliable method for destroying insects present in seeds imported into this country, without injury to the seed, led the authors to conduct experiments with a vacuum chamber into which some gaseous insecticide could be introduced. The construction of the apparatus devised, which consists of a fumigation chamber of iron tubing 36 in. long by 12 in. in diameter and an air pump, is described. The air pump, driven by a motor and capable of reducing the air pressure to the equivalent of about 0.05 mm. of mercury, is used to secure an almost complete vacuum of the fumigation chamber, which is fitted with a vacuum gauge, etc.

The results of the experiment in which hydrocyanic acid gas was introduced into an air-tight chamber from which the air had been practically exhausted, here presented in tabular form, show the method to be effective for various seeds, insects, and conditions. In an experiment with ten avocado seeds infested with larvæ of *Conotrachelus* sp. and the broad nosed grain weevil in all stages, an exposure of gas generated from 4 gm. of sodium cyanid for one-fourth hour was effective, fifty insects of different stages having been killed and all the seeds having germinated. Two gm. of sodium cyanid were effective when the exposure was increased to one-half hour.

It is stated that further experiments with special reference to the use of carbon bisulphid will be conducted.

Report of the entomologist, R. H. PETTIT (*Michigan Sta. Rpt. 1914, pp. 232, 233*).—A brief statement of the work of the year including the occurrence of several insect pests of considerable economic importance.

The carrot rust fly (*Psila rosæ*) appears to have become established at Sault Sainte Marie where it injured a small area of table carrots in 1913. It is pointed out that in addition to carrots it attacks celery, parsnips, and perhaps other vegetables, and that in Europe it has proved to be a difficult pest to control. The clover snout beetle (*Sitones hispidulus*) is reported to have been

the source of considerable injury to alfalfa, and two species of apple red bugs were found in considerable numbers. The occurrence of a snout beetle (*Ana-metris grisea*) on apple for the first time in Michigan, a tree hopper (*Ceresa*) in young apple orchards where it killed the twigs, and the clover seed caterpillar (*Enarmonia interstinctana*) which injured June clover heads in a restricted area after a rest of some 20 years, is reported.

Report of the department of entomology (Oregon Sta. Bien. Crop Pest and Hort. Rpt. 1913-14, pp. 95-202, figs. 98).—This second report, prepared under the Crop Pest and Horticultural Law of 1911 (E. S. R., 29, p. 158) contains a statement of the investigations carried on during the years 1913 and 1914, and summarized accounts of important insect pests, including the nature of their injury, life history and habits so far as known, technical description, methods of control, and references to the literature thereon.

The insects thus discussed are the fruit tree leaf Syneta (*Syneta albida*) and the eye-spotted bud moth by H. F. Wilson and G. F. Mozzette; the fruit tree leaf roller (*Archips argyrospila*), the peach twig moth (or peach and prune twig borer), an apple leaf miner (*Phyllonorycter (Lithocolletes) crataegella*), a new cherry pest (*Simplemphytus pacificus*), injurious gall mites [the pear-leaf blister mite, the grape leaf mite (*Eriophyes vitis*), the walnut leaf mite (*E. tristratus crinea*), and the filbert bud mite (*E. avellanae*)], insect pests of stored products [the Indian meal moth and the saw-toothed grain beetle (*Silvanus surinamensis*)], the thistle butterfly (*Vanessa cardui*), grasshoppers in Oregon, insecticide investigations of 1914, and minor insect pests [the Prionus beetle (*Prionus californicus*), the bud weevils (*Sciopithes obscurus*, *Paraptochus sellatus*, and *Thricolepis inornata*), the bud click beetle (*Limonius discoideus*), the blossom fly (*Bibio nervosus*), a peculiar undetermined apple insect which mines under the skin, the black cherry aphid (*Aphis cerasi*) on nursery stock, two apple and pear membracids (*Stictocephala inermis* and *Ceresa basalis*), and the spotted Diabrotica (*D. soror*) as a fruit pest], by H. F. Wilson; the variegated cutworm, and the olive green cutworm (*Dargida procinctus*), the rose curculio (*Rhynchites bicolor*), injuring blackberry buds, the radish weevil—a new pest (*Cleonus sparsus*), clover seed injured by midge (*Dasyneura leguminicola*), nematode gall worms or eelworms (*Heterodera radiculicola*), tipulid work in prune wood (*Ctenophora angustipennis*), and tomato worms, by A. L. Lovett; the antique or rusty tussock moth (*Notolophus antiqua*), by L. G. Gentner; the brown lace-wing (*Hemorobius pacificus*), by G. F. Mozzette; the alfalfa looper (*Plusia californica*) as a truck crop pest, by L. Childs; and the rose leaf hopper as a fruit pest (*Empoa rosæ*), by H. F. Wilson and L. Childs.

The fruit tree leaf Syneta, which has never been recorded outside the Pacific Northwest, is the source of considerable injury to fruit trees, including the apple, pear, cherry, prune, etc., through the feeding of the larvæ upon the fibrous roots and the adults upon the flowers, foliage, and fruits. It is stated that cultural methods are not at the present time of any avail and that spraying thus far has not been found profitable in its control. Spraying experiments conducted against the bud moth led to the conclusion that oil sprays as ordinarily used are not effective. The fruit tree leaf roller is said to be found quite generally throughout the Willamette Valley. Investigations have led to the recommendation that a 10 per cent crude oil emulsion be applied about the time the buds are opening, or earlier if the eggs are found to be hatching earlier. Should the oil fail to kill the eggs, an application of arsenate of lead 2:50 should be made just before the blossoms open. The apple leaf miner is said to be quite common throughout the orchards of western Oregon, though not serious enough at the present time to warrant special applications of spray.

A new sawfly (*S. pacificus*), first observed in the winter of 1913, is reported to be the source of some damage to cherry trees. The larvæ of the radish weevil (*C. sparsus*) tunnel about inside the radish, devouring the whole interior of a small plant, and rendering it unfit for food. Tipulid larvæ (*C. angustipennis*) were observed tunneling in the decayed wood of prune trees in an orchard near Corvallis, and the injury, while secondary in nature, is said to be fairly serious since it shortens the life of the infested trees.

Tomato insects, root knot, and "white mold," J. R. WATSON (*Florida Sta. Bul. 125* (1914), pp. 55-78, figs. 14).—A brief popular account is given of the more important insect enemies of tomatoes in Florida and of root knot and white mold and means for their control.

Three cornered alfalfa hopper, V. L. WILDERMUTH (*U. S. Dept. Agr., Jour. Agr. Research, 3* (1915), No. 4, pp. 343-362, fig. 1).—This membracid (*Stictoccephala festina*), first described in 1831 by Say, has become of economic importance to alfalfa crops in the irrigated valleys of the southwestern United States and to alfalfa and cowpeas in the Southern States. Injury is due to the sucking of plant juices by both adults and the larvæ and the development of a feeding scar which often takes the form of a ring or girdle and which is usually accompanied by a gall formation.

In this paper the author deals with its specific identity, distribution, and food plants; presents descriptions of its several stages; and reports studies of its life history and habits, seasonal history, damage to alfalfa and other plants, natural enemies, and preventive measures.

"Plants of the legume family constitute the favorite food. The eggs are deposited in the stems of the food plants, usually back of the sheath leaves or below the surface of the ground. In cowpeas the eggs are deposited in pockets on the stems. The egg period in Arizona occupies from 12 to 41 days and the five stages of the nymphal period from 22 to 69 days. The average combined length for both periods is about 50 days. In southern Arizona there are four generations annually and during extremely mild winters the adult insects are active throughout the season. During colder winter the species hibernates in both the egg and adult stages.

"The alfalfa hopper is little affected by natural enemies and is only reduced in numbers by the variable winter temperatures. The Sonoran redwing [*Agelaius phœniceus marginella*] was found to feed upon the species. The cleaning up of places of hibernation and the eradication of weeds, rubbish, etc., is the only known system that will reduce the numbers of the pest."

A bibliography of 11 titles is included.

Control of green pea aphid in 1914 (*Macrosiphum pisi*), L. B. SMITH (*Virginia Truck Sta. Bul. 13* (1914), pp. 301-312, fig. 1).—This is a report of experiments with control measures for one of the most troublesome and destructive insects with which truck growers in tidewater Virginia have had to contend. The results of spraying experiments lead the author to recommend the use of either of the following formulas: Blackleaf 40 10 oz., whale-oil soap 4 lbs., and water 50 gal.; or whale-oil soap 5 lbs. and water 50 gal. The spray should be applied within one or two days after the aphidids are found on the pea vines and two or three sprayings may be necessary especially if the aphidids are very numerous. The second spraying should come about one week after the first. The growing of clover, especially crimson clover, in the vicinity of the pea field should be avoided if possible since this species passes approximately eight months of the year on clover.

The life history and habits of the corn earworm (*Chloridea obsoleta*), H. GARMAN and H. H. JEWETT (*Kentucky Sta. Bul. 187* (1914), pp. 513-591, pls. 13, figs. 3).—Observations of the bollworm or corn earworm in Kentucky were

commenced by the senior author in 1889 in which year it was very common and has since remained so. It is not as common in some seasons as it is in others; it may be difficult to find in a locality one summer and appear in very great numbers in another. In 1893 it was observed working on tobacco and has since been found constantly present where tobacco is grown next to corn. The authors' observations indicate that tomatoes are not the favorite food, but that the worms feed upon them when corn becomes too ripe or none is to be found.

In 1907 plantings of several widely different varieties of corn, including field and table varieties, were made with the view of determining its preference, if any, and the time at which corn is most subject to injury. The results which are presented in tabular form show an increase in the injury with the advance of the season, the early plantings, without regard to variety, generally showing less injury than those planted later.

"Sirup baits constantly used with a view to showing when the moths were abroad in the field failed to attract a single one. Electric lanterns of excellent quality also failed to attract the moths though kept in some cases in the midst of corn. Larvæ of the second brood were secured in August, and on the twelfth to the nineteenth of the month left the corn for pupation. Adults from these pupæ emerged in early September (August 28 to September 9) in confined examples, and on the eleventh eggs were found attached to the silks. Larvæ hatched from some of these eggs September 14, and pupated October 17. Adults of one or another brood were abroad during all this period, apparently. On September 11 eggs were found attached to silks. On October 9 . . . corn planted August 5 was found to have eggs on every ear, sometimes six or eight on the silks, occasionally one at the edge of the husks. They were noted as abundant again on the nineteenth and twenty-second. On the twenty-fourth they were noted as hatching, and individuals of the brood were confined and followed to maturity." A record is given of 165 moths reared in the laboratory from eggs that were laid from September 7 to 11, the first adults emerging on September 28 of the same year and the last on August 14 of the following year. Rearings showed that the minimum time required for complete development from egg to adult was about one month and three or four days. "The fact is patent that the corn earworm begins its injuries in the spring as soon as it finds suitable food and continues producing broods at the rate of about one a month until severe frost destroys its food again in the fall."

"Taking the average period of a brood as about 32 days, from egg laying to egg laying, and beginning with the brood represented by the example secured June 13 and emerging July 11, ending with that reared in September and October, it appears that three broods developed as follows: (Brood 1) egg about June 10, pupa June 26, adult July 11; (Brood 2) egg July 13, pupa July 28, adult August 12; (Brood 3) egg August 14, pupa August 29, adult September 12; (Brood 4) egg November 3. Brood imperfect owing to frost."

Observations made in 1913 at Hickman, the only region in which cotton is grown in Kentucky, are reported. The life periods as observed in 1913 are detailed in tabular form. In observations made in November, 1911, in plats planted in corn, pupæ were taken from the soil at depths varying from 1 to 7 in. and at distances from the nearest corn stalk varying from 4 in. to 2 ft. 4 in.

Tests of the value of arsenate of lead paste and powder in 1914 in the control of the pest on corn failed to justify the expense involved. Mention is made of a bacterial disease observed in the fall of 1911.

Biological notes are presented upon seven different insect enemies observed during the course of the work. *Trichogramma pretiosa* parasitized 81 of 1,661 bollworm eggs collected in 1913. The larva of a telephorid beetle, perhaps

Chauliognathus marginatus, is said to follow the worms into their burrows and during some seasons devour large numbers of them. The common lady beetle *Megilla maculata* of which there are at least three broods during the season in Kentucky is said to be a constant frequenter of corn where it feeds upon the egg. Records of the rearing of three broods in the insectary are detailed in tabular form. *Hippodamia convergens* frequents corn silk and feeds upon the eggs of the bollworm, at Hickman it having been found on corn in about equal numbers with *M. maculata*. A true bug, *Coriscus fesus*, of which two broods were reared in the insectary, is said to have proved to be a useful check in the increase of the pest. The insidious flower bug (*Triphleps insidiosus*), while appearing to feed to some extent on plant juices, is common among corn silk and is very useful because of its destruction of the egg. It was found to oviposit in the tender corn silk and rearing studies reported show four molts to occur before it reaches maturity. The average time passed in development of the eggs to maturity was 15 days, 3¼ hours. The lace-wing fly *Chrysopa oculata*, a common enemy, was reared through three broods in 1912, the number of eggs deposited by a single individual varying from 27 to 56.

The illustrations include colored plates which show the color variations of the adult and larva. A monograph of this pest by Quaintance and Brues of this Department has been previously noted (E. S. R., 17, p. 160).

[Codling moth investigations], F. GARCIA (*New Mexico Sta. Rpt. 1914*, pp. 67-71, figs. 3).—Experiments conducted to determine the attractivity of electric lights of various colors placed in the orchard brought out the fact that a large proportion of the first brood of moths, developing from wintered-over larvæ, are either males or infertile females. Charts are given which show the time of emergence of the maximum number of wintered-over codling moths, irregularity of emergence of the larvæ of the different broods, and the time at which the larger number of larvæ occurred. The results of spraying work, based upon a life history study, as shown in tabular form, is thought to have been very satisfactory.

The European pine shoot moth; a serious menace to pine timber in America, A. BUSCK (*U. S. Dept. Agr. Bul. 170 (1915)*, pp. 11, pls. 6).—This is a more detailed account of *Evetria buoliana* than that previously noted (E. S. R., 32, p. 251).

The author deals with the history of the species in Europe, food plants, introduction and distribution in America, life history, character of injury, description of the several stages, allied American species, natural enemies, and method of control. Survey investigations made during the summer of 1914 have established the fact that the species has been repeatedly introduced on European nursery stock and that it has become established in nurseries and parks in several localities scattered over nine States, namely, Massachusetts, Connecticut, Rhode Island, New York, New Jersey, Pennsylvania, West Virginia, Ohio, and Illinois. It is stated that in none of these localities, except on Long Island, has the species existed for more than the last two years, and in most of them it has become established only within the last year. As yet the pest has been found only in nurseries and private parks supplied by these infested nurseries. In no case has it yet been found on forest trees in America. It is confined to pine and does not attack other coniferous trees. It is pointed out that the species attacks mainly young trees between 6 and 15 years of age, but it is often excessively destructive to younger plantings and seedlings and injurious also to older trees, though trees of 30 years or older are rarely seriously affected.

The full life history of the species in America has not been ascertained. While in the main it is the same as in Europe, a very distinct difference has

already been noticed, due to the longer and warmer summer and fall in this country. The author expresses the opinion that at the present time it is possible to eradicate the pest from this country.

A list of literature relating to the subject, consisting of 13 titles, is appended.

The Mediterranean fruit fly in Bermuda, E. A. BACK (*U. S. Dept. Agr. Bul. 161* (1914), pp. 8).—This paper, based upon an investigation made by the author in Bermuda during December, 1913, discusses the history of the fruit fly in Bermuda, its life history, host fruits, and the possibility of eradicating it from those islands.

For nearly fifty years the peach industry of Bermuda has been ruined by this pest, which is thought to have gained entrance in 1865 in a cargo of fruit from the Mediterranean region bound for New York which storms forced to discharge there. Since that time it has spread over the islands, which consist of 19½ square miles of rolling country, and has long since ruined the excellent peach industry enjoyed by Bermuda in the early days and caused such discouragement among prospective fruit growers that at the present time native-grown fruit in Bermuda is a luxury. To the 47 fruits listed by Winter in the bulletin previously noted (*E. S. R.*, 29, p. 656) as attacked by the Mediterranean fruit fly in Bermuda, the author adds the ball kamani (*Calophyllum inophyllum*), the prickly pear (*Opuntia* sp.), and the acordia.

It is stated that while at the present time Bermuda is probably a source of comparatively small danger to the United States as a source of infestation by this pest, both on account of trade relations and the climatic conditions surrounding New York, its extermination in these islands will be decidedly to the advantage of both Bermuda and the United States. It is pointed out that the topography of these islands is such that they can be easily inspected; that the trees and shrubs, the fruits of which are subject to infestation, are comparatively few numerically; and that a large proportion of the uncultivated land supports little that is subject to attack. Experience in all countries where clean cultural work has been undertaken, but especially in the city of Honolulu, has shown that no lasting beneficial results will follow such work as has been carried on in Bermuda unless extermination is the object in view. "The value of the fruit grown in Bermuda is not sufficient to warrant work being carried on with any other object. In no country where the fly now exists could work of extermination be undertaken with such assurances of success as in Bermuda. If clean cultural work were supported continuously by adequate legislation and undertaken by a person sufficiently conversant with the problem and eager to make a unique record in the entomological world, the Mediterranean fruit fly could be exterminated from Bermuda within three years, without the expenditure of a prohibitive amount of money."

Susceptibility of citrus fruits to the attack of the Mediterranean fruit fly, E. A. BACK and C. E. PEMBERTON (*U. S. Dept. Agr., Jour. Agr. Research*, 3 (1915), No. 4, pp. 311-330, pls. 3, figs. 3).—The authors here report the results of investigations conducted in the Hawaiian Islands which tend to show that even if *Ceratitis capitata* should obtain a foothold in the warmer portions of the United States, it probably would not be the serious pest to fruit that previously published literature would indicate. The paper includes a historical review and discussion of host fruits, habits of the fly, proportion of egg punctures containing eggs, mortality of eggs and larvæ, persistent attack leading to infestation of the pulp, secondary attack of citrus fruits by insects other than the fruit fly and by fungi, and effect of attack of the Mediterranean fruit fly upon citrus crops of California and Florida.

The authors point out that citrus fruits are not the favored host fruits of *C. capitata* that the earlier writers thought. "While grapefruit, oranges, lemons, and many limes may become quite badly infested with well-grown larvæ if allowed to remain on the tree long after they become sufficiently ripe for the market, nature has so well equipped them to withstand attack that larvæ are seldom found in their pulp until they are much overripe. Oranges and grapefruit are generally eaten and found uninfested if gathered as they ripen." The oil of the cells ruptured in the formation of the egg cavities kills a large percentage of the eggs and newly-hatched larvæ. "Larvæ that succeed in entering the rag from the egg cavity are able to reach the pulp in astonishingly small numbers because of the imperviousness of the rag. It is only the persistent attack of successive lots of larvæ hatching from different batches of eggs laid in the same puncture in which the oil has become inoperative that finally breaks down the barrier between the young larvæ and the pulp.

"The Mediterranean fruit fly is quickly affected by low temperatures. A temperature of about 56° F. has lengthened the time required by the fly to pass from the egg to the adult stage from 14½ to 91 days. A temperature ranging from 50 to 55° will either seriously check development or kill large numbers of the immature stages of the fly. The winter monthly mean temperatures of California and Florida are so similar to those of the citrus regions of southern Spain and Italy and of Sicily that it is to be expected that the fruit fly if introduced to the mainland would not become a serious pest to *Citrus* spp. It happens that the very cold temperature necessary to bring citrus crops to that degree of perfection in which they are most susceptible to fruit fly attack likewise renders the fly so inactive or sluggish that it may be disregarded as a pest for that period of the year.

"In addition to the assistance of adverse climatic conditions during that part of the year when they are most needed to protect citrus crops, the growers of California and Florida are still further protected—and most admirably so—from attack by the very scarcity of wild host fruits that can not be destroyed. It will be found a practicable undertaking to remove such a number of noncitrus host plants at present growing about commercial citrus orchards that the succession of fruits in which the Mediterranean fruit fly can breed during the large portion of the year when citrus fruits are unavailable for attack because of their greenness will be reduced to a minimum, if not entirely done away with. It is under conditions such as can be secured in California and Florida that the excessive mortality occurring in the rind will become a valuable factor in preventing infestation or establishment of the pest, as each fruit will in reality become a trap for stray females. The scarcity of host fruits will also make spraying with poisoned baits a practical undertaking, should it become necessary to resort to artificial methods of control."

A bibliography of 7 titles relating to the subject is appended.

[Serious outbreak of *Haltica foliacea*] (*New Mexico Sta. Rpt. 1914*, p. 82).—An outbreak of this flea-beetle upon grapes and young fruit trees is said to have been checked through the use of powdered arsenate of lead applied at the rate of 1½ lbs. to 50 gal. of water. This mixture is said to keep the beetles off the foliage for the most part and to prevent damage if applied in time.

Observations on the life history of *Agrilus bilineatus*, R. N. CHAPMAN (*U. S. Dept. Agr., Jour. Agr. Research*, 3 (1915), No. 4, pp. 283-293, pls. 2).—It is stated that at the present time the two-lined chestnut borer (*A. bilineatus*) is commonly associated with the death of many oaks (*Quercus alba*, *Q. macrocarpa*, *Q. rubra*, and *Q. coccinea*) in the southern part of Minnesota. In the neighborhood of St. Paul and Minneapolis large numbers of oaks, many of them

on valuable residence property, have been killed during recent years and their death has been commonly attributed to this pest. In some of the outlying districts areas of several acres in extent have been completely devastated, leaving the land treeless.

In this paper the author presents the results of work commenced in the fall of 1913 at the University of Minnesota and continued during 1914 at the Minnesota Station.

Members of the black oak group are said to be slightly more susceptible to attack than those of the white oak group, but in localities where infestation is severe none of the species is exempt. It has often been found that the shoe-string fungus (*Armillaria mellea*) has apparently been the cause of the weakened condition of the trees and that the borers have followed it.

In 1914 adults were first observed on June 17 and increased in numbers until they reached their greatest abundance about July 1. The females were ovipositing from June 19 to July 13, the eggs being deposited in deep cracks between ridges of the bark on the trunks and larger limbs and especially near the ground. Oviposition is said to have lasted from 1 to 5 minutes, from 1 to 10 eggs being laid in a cluster. In the laboratory they hatched in from 10 to 13 days. The newly-hatched larvæ, which measure from 1 to $1\frac{1}{2}$ mm. in length, were found capable of reaching the cambium layer in 24 hours by burrowing for $2\frac{1}{4}$ mm. "Observations show that burrows made during the first instar often go obliquely across the grain of the wood or with the grain, the larvæ being indifferent as to whether they go up or down the tree. . . . The burrows measured showed that the larvæ had burrowed for a distance of 60 to 135 mm. when the first molt took place. . . . The burrows made during the second instar measured about 900 μ in width and took about the same course through the cambium layer, but they were about twice as long. At the beginning of the third instar quite a different course was usually found, especially in green bark on the trunks of trees, where the burrows were almost always transverse to the grain of the wood. The burrows of the fourth instar were about 2 mm. in width and often attained the length of 500 or 600 mm. Where the bark was thick these burrows were quite generally transverse to the grain of the wood. This condition, as well as the oblique course of some of the smaller burrows, is well shown [in a plate accompanying this article].

"At the close of the fourth instar the larva burrows out into the bark, if it is thick enough, and constructs a cell in which it hibernates. Here pupation takes place in the spring. These cells are found in the ridges of the bark on the trunk and larger limbs of the tree and in the wood on small, thin-barked trees and limbs. In constructing the cell the larva burrows out to within a few millimeters of the surface of the bark, withdraws itself 2 or 3 mm., then turns about to one side and excavates around the posterior portion of its body until an oblong cell has been constructed. . . . From the point where the larva entered the bark to the place it emerged from the wood after the first molt the burrow measures 69 mm. in length and 270 μ in width."

While the author has not thus far determined the duration of the instars, larvæ were found in the first stage from July 21 to August 13, and mature larvæ were found in their pupal cells as early as August 7, while the intermediate stage was found throughout this period. It was found that when larvæ were so numerous that they confront each other, one or the other is eaten through as if it were merely cambium tissue. Attention is called to the "wide distribution of the burrows on the tree, from the small branches less than an inch in diameter and between 40 and 50 ft. from the ground down even to the roots, where in one case a larva was found constructing a pupal cell 11 in. below the surface of the ground."

The pupal stage which was studied in the laboratory was found to last about 10 days. Observations indicate that in Minnesota the insect normally pupates during the latter part of May and emerges from the cell about the middle of June.

Two parasites were observed, one belonging to the genus *Atanycolus*, the other an undetermined trichogrammid. As regards control measures it is stated that the cutting and burning of infested trees before the emergence of the adults in the spring heretofore recommended is an effective method and needs emphasizing. The need of other methods is thought imperative. The trunks and large limbs were sprayed during the egg-laying season with an iron sulphate and lime-sulphur mixture and others with a Bordeaux mixture as a preventive measure. The results indicate that it was successful in preventing much oviposition.

Contributions toward a monograph of the scolytid beetles.—II, Preliminary classification of the superfamily Scolytoidea, A. D. HOPKINS (*U. S. Dept. Agr., Bur. Ent. Bul. 17, pt. 2, tech. ser. (1915), pp. VI+165-232, pls. 8, figs. 17*).—This second part of the bulletin previously noted (*E. S. R.*, 21, p. 557) discusses the taxonomy and presents a preliminary classification of the families and subfamilies of the scolytid beetles of the world. The discussion and classification are said to be based upon a study of representatives of about 122 described and undescribed genera and about 1,000 species of North America and other countries in the collections of the U. S. National Museum and certain other museums and institutions of this country.

Following a brief introduction, a discussion of the position of the Scolytoidea and the general anatomy, the taxonomy, including morphological characters, physiological characteristics, geographical distribution in its bearing on taxonomy, etc., is dealt with at considerable length (pp. 169-216). A brief discussion of the species, the genus, nomenclature, types of genera, and a description of a new genus and species (*Webbia dipterocarpi*) from the Philippines follow. The author's preliminary classification of the superfamily is presented in the form of keys to the families and subfamilies, four of the former, Ipidæ, Scolytidæ, Scolytoplatypodidæ, and Platypodidæ, and twenty of the latter being recognized.

A list is presented which shows the position of the principal described genera in the preliminary classification. A bibliography of the literature relating to the subject consisting of four pages is appended.

Descriptions of some weevils reared from cotton in Peru, W. D. PIERCE (*U. S. Dept. Agr. Rpt. 102 (1915), pp. 16, pls. 2, figs. 6*).—This paper presents descriptions of a number of species reared by C. H. T. Townsend from cotton stalks, squares, and bolls in Peru. Two genera and seven species, namely, *Mylabris peruanus* n. sp., *Pachybruchus verticalis* n. sp., *Spermophagus piuræ* n. sp., *Eustylomorpha squamipunctatus* n. g. and n. sp., *Menetytus variegatus* n. sp., *Sibinia peruana* n. sp., *Gasterocercodes gossypii* n. g. and n. sp. are thus described, and notes on two additional species, namely, *Anthonomus vestitus* (*E. S. R.*, 25, p. 763) and *Geraeus perscitus*, are included.

FOODS—HUMAN NUTRITION.

Food industries, H. T. VULTÉ and SADIE B. VANDERBILT (*Easton, Pa.: The Chemical Publishing Co., 1914, pp. VIII+309, figs. 78*).—The authors have incorporated in this text-book the material collected as the result of many years' experience in lecturing on the manufacture of foods and food products. The essential steps of the manufacturing processes are described without going to

any great extent into a discussion of the physics and chemistry involved. One chapter is devoted to water supplies and describes briefly the various methods employed for their purification. Other subjects dealt with are the manufacture of cereal products including flour and bread, the manufacture of leavening agents, the sugar industry, the starch industry, animal foods and the packing industry, the production of milk and milk products, the preservation and canning of foods, and the production of tea, coffee, cocoa, spices, and condiments.

Food and diet, JEAN B. PEACOCK (*Dept. Agr. New Brunswick Bul. 10, pp. 12*).—A popular presentation of fundamental principles of nutrition.

Foods and sanitation, EDITH H. FORSTER and MILDRED WEIGLEY (*Chicago: Row, Peterson Co., 1914, pp. 396, figs. 83*).—This book is intended for use as a laboratory manual for courses in domestic science. It considers the fundamental principles involved in the economical use of fuel, the processes of sterilization, cooking, and other methods for the preparation of food and food products, and the selection and choice of foods. The subject matter is illustrated by a large number of experiments. The second part of the book is devoted to sanitation in the home and presents briefly data regarding the causes of the more common diseases, together with hints as to how they may be avoided. In this connection chapters are devoted to a discussion of ventilation, heating, lighting, plumbing, water supply, sewage and garbage disposal, and fire protection in the home.

The preservation and care of food, JEAN B. PEACOCK (*Dept. Agr. New Brunswick Bul. 9, pp. 12*).—A popular presentation of principles of sanitation as applied to the care of food in the home.

Bread cereals and bread, M. P. NEUMANN (*Brotgetreide und Brot. Berlin: P. Parey, 1914, pp. VII+615, figs. 181*).—This book is intended for use as a text-book in technical and agricultural high schools and in experiment stations, and considers the physical, chemical, and biological properties of the various cereal grains.

A part of the book is devoted to a discussion of the storing of grains with special reference to the organisms which bring about spoiling. Another part deals more in detail with the bread-making cereals, rye and wheat. Both the chemical and biological factors in the preparation of flour and bread making are considered at length. Attention is given to the mechanical side of this question, and the various mechanical processes are described in detail, as well as illustrated by numerous figures and diagrams.

Milling and baking qualities of Victorian wheat, A. E. V. RICHARDSON, P. R. SCOTT, and F. G. B. WINSLOW (*Jour. Dept. Agr. Victoria, 12 (1914), No. 9, pp. 538-545, figs. 4*).—The wheats grown in New South Wales, Victoria, South Australia, and Western Australia, during the season 1913-14 were compared as to physical properties, chemical analysis, and baking qualities.

Rope in bread, ZECKENDORF (*Nat. Assoc. Master Bakers [Proc.], 16 (1913), pp. 66-78*).—This paper summarizes experiments performed for the purpose of testing what constitutes "rope" in bread.

Several species of rope bacteria were isolated which proved very sensitive to acids, but whose spores had great capacity for resisting heat. These bacteria were traced to the flour and not to the yeast. The addition of lactic acid to the dough proved very efficient in preventing the development of rope. Several sanitary recommendations are also made.

The paper is followed by a discussion.

Report on bread wrapping (*Nat. Assoc. Master Bakers [Proc.], 16 (1913), pp. 161-193*).—This report embodies the results of a chemical and bacteriological study of the question of bread wrapping carried out by commercial chemists

for the National Association of Master Bakers. Analytical data are presented from which the following conclusions in part are drawn:

The wrapping of bread in waxed or paraffin paper is not recommended, as it holds the moisture upon the surface of the bread and produces injurious effects upon the quality of the product. It is stated that the wrapping of bread in porous paper, which allows a gradual loss of moisture and ventilation, may be used with satisfactory results in most cases, except in the cases of Vienna and rye bread, the wrapping of which impairs the crispness and flavor of the crust.

Fenugreek seed, M. WUNSCHENDORFF (*Jour. Pharm. et Chim.*, 7. ser., 10 (1914), No. 4, pp. 152-157).—Because of its high nitrogen and phosphorus content this grain should possess great nutritive value. The results of experiments here reported indicate that its disagreeable and intensely penetrating odor and flavor, which prevent its use in medicine, may be removed by germination of the grain and subsequent treatment with boiling alcohol.

All about milk, M. J. ROSENAU ([New York]: Metropolitan Life Insurance Co., 1914, pp. 35, figs. 22).—This pamphlet, which is distributed by the Metropolitan Life Insurance Company to its policy holders, points out the dangers from contamination of milk, gives advice regarding the care of milk in the home and the precautions which should be taken in its use, and reviews briefly the relation of milk to infectious diseases.

Viscose—a new casing for sausages, W. P. COHOE, E. C. FOX, and A. J. ACTON (*Jour. Soc. Chem. Indus.*, 33 (1914), No. 19, pp. 947, 948).—It is stated that this artificial sausage casing, prepared from wood pulp, consists only of cellulose (hydrate), moisture, glycerin, and a trace of ash. The advantages claimed for this product over the natural casings are that it is cheaper and does not furnish food for the growth of molds and bacteria. It is further claimed that the product is in part at least digestible, and that when eaten it involves the ingestion of a smaller percentage of cellulose than many of the breakfast foods prepared from whole wheat.

Are hardened fats suitable for human food? K. B. LEHMANN (*Chem. Ztg.*, 38 (1914), No. 75, pp. 798, 799).—Hardened products made from peanut, cottonseed, and sesame oils showed on chemical examination a nickel content of from 0.07 to 6.1 mg. per kilogram. Feeding experiments with dogs led to the conclusion that an ingestion of 2 mg. of nickel per kilogram of body weight is harmless. The author concludes that hydrogenated oils contain inappreciable amounts of nickel and that there is no objection to the use of such fats as foods.

Ice cream studies in Cincinnati, C. BAHLMAN (*Amer. Jour. Pub. Health*, 4 (1914), No. 11, pp. 1009-1015).—Laboratory experiments were carried out to determine the effect of the gelatin, eggs, sugar, vanilla powder, and cream used upon the bacterial content of ice cream.

From the results it appeared that the great majority of the bacteria were derived from the cream, comparatively few being contributed to the finished product by the other ingredients. It was also apparent from these investigations that the colon bacillus will generally be present in 10 cc. samples and occasionally in 1 cc. samples owing to the widespread occurrence of this organism.

Proper pasteurization of the cream reduced the bacterial content of the ice cream, and pasteurization of the mixture just before freezing caused a still greater reduction. The taste of the ice cream was not affected by the pasteurization.

The uses of fruit in the household, A. ETHEL DUNBRACK (*Dept. Agr. New Brunswick Bul.* 5 (1914), pp. 8).—Recipes and directions for the household canning of fruits are given.

On the analysis and composition of some proprietary foods for infants, J. L. BAKER (*Rpts. Local Govt. Bd. [Gt. Brit.], Pub. Health and Med. Subjs.*, n.

ser., No. 80 (1914), pp. 49–83).—Analytical data are given regarding a number of different kinds of these products.

From these results the foods are classified as follows: Those consisting of dried cows' milk mixed with hydrolyzed starch products or malt flour; foods consisting for the most part of ground meals such as wheat flour, lentils, oatmeal, or arrowroot, and in which no alteration of the starch, other than that caused by heating, has taken place during manufacture; foods consisting of ground meals but mixed with a proportion of malt flour or malt extract, (these foods when prepared for use containing the starch in a gelatinized condition); foods in which the starch is altered during the process of preparation according to directions; and partially or wholly altered starch foods, in which the starch or some of it has been converted into soluble products during the process of manufacture. Most of the foods examined showed a deficiency in fat and had a protein content approximately equal to that of average wheat flour.

On the use of proprietary foods for infant feeding, F. J. H. COUTTS (*Rpts. Local Govt. Bd. [Gt. Brit.], Pub. Health and Med. Subjs., n. ser., No. 80 (1914), pp. 3–49*).—From this digest of data regarding the nature, chemical composition, and preparation of a large number of proprietary infant foods the general conclusion is drawn that many of such products are not only unfit for the feeding of infants under seven or eight months of age but may cause serious injury. This injury may be caused by the presence of either a greater or less amount of starch or of an excess of carbohydrates in relation to protein and fats or else by a deficiency of fats. A number of recommendations for remedying this condition are made, the most important of which is an argument for proper labeling. The appendixes contain extracts from the laws of other countries regulating the manufacture and sale of proprietary infant foods, and a bibliography.

Increasing the fat content of infants' food, A. NIEMANN (*Jahrb. Kinderheilk.*, 79 (1914), No. 3, pp. 274–287, figs. 4; *abs. in Jour. Amer. Med. Assoc.*, 62 (1914), No. 16, p. 1291).—The author claims that substitutes for mother's milk contains too little fat and that there is a tendency to increase carbohydrates and decrease fats. Such injury as may result from too high fat content is attributed to the presence of lower fatty acids. It is recommended that this difficulty be overcome by adding to the food butter which has been thoroughly and repeatedly washed with cold water until it has lost all its acid reaction. Enough butter should be added to bring the fat content of the food up to that of normal mother's milk. The food should be warmed and, after the butter is added, shaken thoroughly to form a fine emulsion.

[Food analyses and pure food and drug topics], E. F. LADD and ALMA K. JOHNSON (*North Dakota Sta. Spec. Bul.*, 3 (1915), No. 14, pp. 240–248).—In addition to analytical data regarding samples of foods and drugs inspected, general and specific information is given with reference to patent medicines.

[Inspection and analysis of foods and feeding stuffs], B. L. PURCELL (*Quart. Rpt. Dairy and Food Comr. Va.*, 1914, June–Sept., pp. 43).—This report reviews the work carried out under the state food and drug laws, and gives data regarding the inspection of dairies, bakeries, slaughterhouses, hotels, restaurants, and other places where food is packed, prepared, or handled. Analytical data are included regarding a number of samples of a wide range of food products.

Sanitary standard for bakeries adopted by the National Association of Master Bakers (*Nat. Assoc. Master Bakers [Proc.]*, 16 (1913), p. 2).—The text of a sanitary code is given.

Home economics as applied to the choice and preparation of food, JEAN B. PEACOCK (*Agr. New Brunswick Dept. Bul.*, 8, pp. 12).—General information is

given regarding the introduction of labor-saving devices and economy in the selection, choice, and preparation of foods.

The art of good living—French cookery from the 14th to the 20th century, compiled and edited by E. RICHARDIN (*L'Art du bien manger—La cuisine française du XIV^e au XX^e siècle. Paris: Editions d'Art et de Litterature, 1914, 5. ed., enl., pp. XLVI+946, pls. 27, figs. 113*).—Besides over 2,000 recipes, some of them taken from old manuscripts, some collected in remote parts of France, and some contributed by well-known professional cooks and also by distinguished writers, this volume contains reproductions of old paintings representing the preparation and serving of foods at different periods, and an article by the editor in which are summarized data on the food preparations characteristic of different sections of France.

Principles of cooking, EMMA CONLEY (*New York: American Book Co., 1914, pp. 206, pl. 1, figs. 41*).—This book presents for the student of domestic science fundamental principles of the choice, selection, cooking, and serving of food.

Reducing the cost of living, S. NEARING (*Philadelphia: G. W. Jacobs & Co., 1914, pp. 343*).—A summary and discussion are given of important factors influencing the cost of living. Chapters are devoted to the economical consideration of the changing form of American living, the increasing demands for service and luxuries, and a number of causes of the advance in prices. A part of the book is devoted to a discussion of remedial measures suggested by the author, among the more important of which are the adoption of simpler methods of living, social education, increased efficiency in food distribution, better conservation of resources, and an increase in the efficiency of labor.

Second Congress of Alimentation, Liège, October 1-4, 1911 (*2. Cong. Aliment. Liège, 1911, pt. 2, pp. 499, pls. 2, figs. 9*).—A report of the proceedings of the congress is given which includes the transaction of routine business as well as more technical discussions. A number of papers upon various subjects relating to foods and nutrition in addition to those contained in the report of proceedings are included. Among these are the following: What Kinds of Veal Should be Rejected as Human Food, by E. Lonhienne; Food Value of Sugar, by Aulard; Food Value of Sterilized and Preserved Milk, by A. Weymeersch; Artificial Feeding and Digestive Disturbances in Infants, by A. Weymeersch; The Economy and Food Value of Fish, by Koettlitz; and Fermented Milks, by J. Effront.

Biochemical catalyzers in daily life and in the industries, J. EFFRONT (*Les Catalyseurs Biochimiques dans la Vie et dans l'Industries. Paris: H. Dunod & E. Pinat, 1914, pp. XI+772*).—This volume, which might serve both as a textbook and as a reference work, deals chiefly with the preparation and properties of the enzymes associated with the processes of digestion and metabolism. The industrial application of enzymes is also considered under such topics as the rôle of proteolytic enzymes in the keeping of flour and in bread making, ferments occurring in the manufacture of cheese, etc.

Vitamins, H. W. BYWATERS (*Sci. Prog. Twentieth Cent., 9 (1914), No. 34, pp. 225-250, pls. 5, figs. 10*).—A summary and digest of data which deals chiefly with the importance of the vitamins in the diet and the relations which they bear to such diseases as beri-beri, pellagra, scurvy, and rickets. The importance of these substances for growth is also considered. Attention is called to the necessity of quality as well as quantity in the diet.

Continuation and extension of work on vegetable proteins, T. B. OSBORNE and L. B. MENDEL (*Carnegie Inst. Washington Year Book, 12 (1913), pp. 299-305*).—This work has been previously referred to from another source (E. S. R., 32, p. 460).

The effect of air breathed upon the metabolism of protein and carbohydrate food, M. BACHE and W. AUER (München. Med. Wchnschr., 61 (1914), No. 16, pp. 868-870).—The results of a series of animal experiments are here presented and discussed. The following conclusions are drawn:

Breathing air deficient in oxygen produces a nitrogen retention which is probably to be regarded as resulting from the storage of protein. A deficiency of oxygen and an excess of carbon dioxide in the air breathed produce glycosuria in the case of well-nourished animals. An increase of carbon dioxide diminishes phloridzin diabetes and increases the blood sugar content. A lack of oxygen in the air breathed has no effect upon phloridzin glycosuria.

The influence of excessive water ingestion on protein metabolism, J. B. ORR (Biochem. Jour., 8 (1914), No. 5, pp. 530-540).—From the results of a series of experiments in which varying quantities of water were ingested, both during and between meals, the author draws the following conclusions:

"The excessive ingestion of water produces an increased excretion of urinary nitrogen which is most marked on a low protein diet; a retention of nitrogen on the return to normal consumption of water in the case of excessive protein intake; an increase in the percentage of total nitrogen excreted as urea; a marked increase in the excretion of creatin, [and] a decrease in the fecal nitrogen which is interpreted as indicating a more complete utilization of the food protein.

"It is suggested that the results indicate that the influence of the increased water consumption is to accelerate both the catabolic and the anabolic phases of protein metabolism."

Gastro-intestinal studies, III (studies on water drinking, XXI).—Direct demonstration of the stimulatory power of water in the human stomach, O. BERGEIM, M. E. REHFUSS, and P. B. HAWK (Jour. Biol. Chem., 19 (1914), No. 3, pp. 345-371, figs. 15).—Men were subjects for experiments in which varied amounts of water were introduced into the stomach by drinking through a Rehfuss tube, and specimens of the stomach contents were then removed at intervals and analyzed for total acidity, free acidity, and peptic activity.

As small a volume as 50 cc. caused in every instance a very distinct stimulation of the gastric glands, as evidenced by increases in both acidity and enzyme value.

Since water stimulates the gastric glands to activity when no food is present in the stomach as well as when there is a digestive task to complete, it would seem a waste of "glandular energy" to drink water between meals.

The excretion of creatinin by human individuals on a prolonged creatin-free diet, A. I. RINGER and G. W. RAIZISS (Jour. Biol. Chem., 19 (1914), No. 4, pp. 487-492).—Experiments are reported in which individuals received a creatin- and creatinin-free diet for a long period of time.

"There was noticeable a gradual and steady decline in the creatinin output per day, a decline that unquestionably lies outside the physiological fluctuations. It is independent of any changes in body weight, and is associated with a steady decline in the creatinin coefficient."

Some observations on the excretion of creatinin by women, MARY HULL (Jour. Amer. Chem. Soc., 36 (1914), No. 10, pp. 2146-2151).—The subjects studied exhibited a low creatinin excretion in comparison with the usual values as found for men.

Metabolism and energy of men, A. LIPSCHÜTZ (Stoffwechsel und Energie-wechsel des Menschen. Leipzig: R. Voigtländer, 1914, pp. XI+189, figs. 17).—This book considers the fundamental principles of human nutrition. Among the subjects included are the chemical nature of foods, the body requirements for

food, the digestive and metabolic processes involved in the maintenance of the body, etc. Descriptions are also given of various types of apparatus which have been used in the study and measurement of energy metabolism and respiratory exchange.

The biochemistry of respiration, H. M. VERNON (*Sci. Prog. Twentieth Cent.*, 9 (1914), No. 34, pp. 251-269).—A summary and digest of data regarding this subject, from which the author draws the general conclusion that the biochemistry of respiration is in the main dependent upon intracellular enzymes. While in some instances this is entirely a hydrolytic process without oxidation, in a majority of organisms the processes are both hydrolytic and oxidative.

Body temperature and pulse rate in man after muscular exercise, E. G. MARTIN, C. M. GRUBER, and T. H. LANMAN (*Amer. Jour. Physiol.*, 35 (1914), No. 2, pp. 211-223, fig. 1).—Experiments with an athlete and an untrained man were conducted for the purpose of ascertaining the relationship between body temperature and the cardio-acceleration of exercise. After muscular exercise, comparisons of axillary temperature and pulse rate were made, leading to the conclusion that no definite parallel exists between persistent cardio-acceleration following exercise and heightened body temperature.

A comparison of the effects upon the blood pressure of physical fatigue produced by prolonged marching with that produced by psychic fatigue resulting from continued mental effort, J. M. LAHY (*Compt. Rend. Acad. Sci. [Paris]*, 158 (1914), No. 25, pp. 1913-1916).—Measurements of blood pressure were made upon soldiers making long daily marches, scientists working in the laboratory, and stenographers working industriously for seven hours. A comparison of these figures before and after work showed that in general physical fatigue produced a diminished blood pressure while mental effort increased the blood pressure.

Influence of the environment on the heat production of the human body, WOBSE (*Arch. Hyg.*, 83 (1914), No. 3-4, pp. 123-154).—A mathematical treatise of heat as applied to the maintenance of normal body temperature is given. It is suggested that heat nerves constitute a part of the central heat regulating system.

Energy metabolism under conditions of chronic malnutrition, P. HÁRI (*Biochem. Ztschr.*, 66 (1914), No. 1-3, pp. 20-47).—Respiration calorimeter experiments were made with laboratory animals (dogs) which had previously undergone a fasting period. The experimental periods varied in length from 20 to 22 hours and were carried out at a temperature of 27 to 29° C. Measurements were made of the energy production and of the nitrogen and carbon balance.

The metabolism of a dog receiving a daily ration of milk insufficient to meet his energy requirements showed either a slight increase or else a gradual apparent decline. A slight increase in energy metabolism was noted in the case of dogs which showed a relatively small loss of protein in the preceding fasting period as well as during the period of malnutrition. In the case of animals showing a considerable loss of protein a decrease in energy metabolism was observed, but a total milk diet tended to prevent this diminished metabolism.

The specific dynamic action of milk was demonstrated in the case of such animals as had suffered a loss of protein and showed a decrease in energy production. Owing to the marked decrease in the metabolism necessary for maintenance, it is deemed conceivable that the increase of energy metabolism brought about by the ingestion of milk can not make itself evident during the 24-hour heat production period.

ANIMAL PRODUCTION.

An important contribution to statistical theory, R. PEARL (*Amer. Nat.*, 48 (1914), No. 572, pp. 505-507).—The author comments on Slutsky's recent contribution extending Pearson's test for the goodness of fit to cover the class of curves formerly not amenable to such test, and the importance of this contribution to biometricians.

The distribution of a Mendelian population in successive generations with continued brother \times sister mating, R. PEARL (*Amer. Nat.*, 48 (1914), No. 565, pp. 58-62).—Starting with a population composed entirely of complete heterozygotes as to a single character, the author follows out the distribution in successive generations with continued brother \times sister mating up to the tenth generation. He shows that the proportion of homozygotes approaches 100 per cent in the same manner as in the case of self-fertilization, but at a slower rate.

Studies on inbreeding.—IV, On a general formula for the constitution of the n th generation of a Mendelian population in which all matings are of brother \times sister, R. PEARL (*Amer. Nat.*, 48 (1914), No. 572, pp. 491-494).—The author endeavors to put in the form of a formula the empirical results presented in the above paper.

Inbreeding and relationship coefficients, R. PEARL (*Amer. Nat.*, 48 (1914), No. 573, pp. 513-523, figs. 2).—In this paper the author calls attention to the fact that "an individual may be inbred in 10 generations to within 0.2 per cent as intensely, measured by the coefficients of inbreeding, if his sire and dam are in no way related, as he would be if his sire and dam were brother and sister."

A method is presented for measuring separately what proportion of the observed inbreeding in a particular case is due to kinship of the parents, and what to earlier ancestral relationship. A proposed coefficient of relationship is described and its application illustrated by concrete cases.

Formulas for the results of inbreeding, H. S. JENNINGS (*Amer. Nat.*, 48 (1914), No. 575, pp. 693-696).—The author expands the work of Pearl (see above) on the results of inbreeding. A general formula is presented for the rate at which organisms become homozygotic through continued brother by sister mating. This consists in "(1) the proportion of individuals that will be homozygotic for any given character after any number of unbroken generations of such inbreeding, (2) the average proportion of the characters of a given individual that will be homozygotic after any number of unbroken generations of such inbreeding. The numerical value so obtained may conveniently be called the coefficient of homozygosis."

The rule is expressed as follows: "The value of the coefficient of homozygosis X for any term (as the n th) is obtained by doubling the numerator and denominator of the fraction expressing the value for the previous term, and adding to the numerator the corresponding ($n-1$ th) term of the Fibonacci series."

Valuation of feeding stuffs by means of chemical analysis, A. SMETHAM (*Analyst*, 39 (1914), No. 464, pp. 481-491).—Analyses are reported of a number of English feeding stuffs including a number of unusual products from India, Egypt, Brazil, and other places.

The influence of the phosphate and potassic fertilizing of meadows on the chemical composition of the forage, C. DUSSERRE (*Ann. Agr. Suisse*, 14 (1913), No. 4, pp. 271-273).—In experiments to determine the influence of phosphatic fertilizing on the composition of grasses, it was found that the phosphorus content was materially increased when phosphorus was added to the meadows in the form of superphosphate.

Studies on the various straws with reference to the crude fiber content and the composition and digestibility under the influences of weathering, F. HONCAMP, F. RIES, and H. MÜLLNER (*Landw. Vers. Stat.*, 84 (1914), No. 5-6,

pp. 301-398).—In these experiments with sheep it was demonstrated that the straws of spring grain are not so poor in crude fiber as the corresponding straws of winter grain. The influence of weathering on the percentage content of the various grain straws was proportionately as slight on the organic as on the inorganic constituents, and not so marked as in the protein-rich roughages, such as meadow and clover hays.

It was found that the König method for determining the crude fiber content did not agree in results with the Weender method, also that the König method of determining the pure cellulose and the incrustated material (lignin and cutin) was not accurate. The Cross and Bevan method for determining pure cellulose is recommended as the best.

The digestibilities of summer and winter grown straws were as similar in this respect as in others. Rape and turnip tops as forage material were approximately equal in value, but inferior to the grain straws. The legumes varied to some extent. It is claimed that the value of roughage consists in its starch value and that any classification as to protein and crude fiber content is misleading. The digestible portion of crude fiber is found in the pure cellulose.

Silos and silage, P. V. EWING (*Georgia Sta. Bul. 110 (1914), pp. 163, 164, 177-190*).—This bulletin contains general information on the value of silage as a feed, methods of growing and harvesting silage crops, silage fermentations, the cost of silage, and the feeding of silage to the various classes of farm live stock.

Shock corn for silage, C. H. ECKLES (*Missouri Sta. Circ. 71 (1914), pp. 25-28, fig. 1*).—It is stated that although not equal to silage from corn put in at the proper stage dry shock corn may be used to advantage in the silo. Tests at the station and elsewhere indicated that approximately 1 lb. of water should be added to every pound of dry fodder. The method recommended for making this silage is described.

The composition, digestibility, and feeding value of molassine meal, cotton-seed meal and hulls, cocoa shells, grain screenings, flax shives, Mellen's Food refuse, and Postum cereal residue (CXX feed), J. B. LINDSEY and P. H. SMITH (*Massachusetts Sta. Bul. 158 (1914), pp. 53-71*).—Molassine meal is described as an English product composed of substantially 70 to 75 per cent of cane or beet molasses and from 25 to 30 per cent of sphagnum moss, and has the following approximate composition: Water 18.43, protein 9.32, fat 0.47, nitrogen-free extract 57.51, fiber 6.75, and ash 7.52 per cent.

Six cows were fed by the reversal method, in periods of three weeks' duration, a basal ration of hay, wheat bran, and cotton-seed meal, to which were added definite amounts of either molassine or corn meal. The total average daily nutrients were somewhat less for the molassine ration than for the corn meal ration. The cows produced substantially 14 per cent more milk and 16 per cent more solids and fat on the corn meal ration than they did on the molassine ration. The cost per quart of milk on the corn meal ration was 3.1 cts. per pound, of butter 26 cts.; on the molassine meal ration 3.8 and 33 cts., respectively. Successful trials in feeding this product to horses are also reported. Molasses as a feeding stuff is discussed.

Analyses are given of cotton-seed meal, cotton-seed hulls, cotton-seed hull bran, and cotton-seed feed meal. It was found that low-grade cotton-seed meal contained about 30 per cent less digestible organic matter than the high-grade material. It is stated that the addition of hulls to cotton-seed meal, even in small amounts, lessens its feeding value by decreasing its protein content and impairing its digestibility. Cotton-seed feed meal containing choice cotton-seed meal and cotton-seed hull bran in equal parts has about one-half the feeding value of choice cotton-seed meal. A gradual deterioration in the quality of the

cotton-seed meal sold in Massachusetts, due to the growing tendency to incorporate more hulls, is reported.

Cacao shells are described as the hard, outside coating or bran of the cacao bean. Their use in this country as a feeding stuff has been quite limited, but in Europe they are used as a partial feed for horses and cattle and as an adulterant for oil cakes. Large quantities are also used by the Swiss as a feed for draft oxen. It is held that they act as a stimulant to the nerves and muscles and enable the animals to do a greater amount of work. An analysis is reported as follows: Water 4.5, protein 13.9, fat 4.91, nitrogen-free extract 55.61, fiber 12.65, and ash 8.43 per cent.

In feeding trials with wheat screenings the fiber did not appear to be at all digestible, indicating somewhat of a depressing effect upon the fiber digestibility of the hay, and the fiber contained in the weed seeds of the screenings was of decidedly inferior character. In chemical composition and digestibility the screenings did not appear to vary greatly from wheat bran.

In experiments with sheep the following coefficients of digestibility were obtained for the several products:

Digestion coefficients with sheep for various feeds.

Kind of feed.	Dry matter.	Protein.	Fat.	Nitrogen-free extract.	Fiber.	Ash.
	<i>Per ct.</i>	<i>Per ct.</i>	<i>Per ct.</i>	<i>Per ct.</i>	<i>Per ct.</i>	<i>Per ct.</i>
Molassine meal	61.98	41.74	.....	71.90	.....	79.48
Cotton seed feed meal	58.23	74.96	100.66	61.20	26.10	49.37
Cacao shells	57.52	11.47	100.48	73.46	50.66	13.64
Wheat screenings	62.94	71.79	88.45	73.19	.....	.....
Flax shives	45.38	81.03	92.68	43.45	25.79	22.78
Mellen's Food refuse	51.15	44.94	83.38	58.36	44.53	.....
CXX feed	42.91	19.81	77.90	62.48	13.39	.....

Analyses of these various feeds are included.

Concentrated commercial feeding stuffs, J. D. TURNER and H. D. SPEARS (*Kentucky Sta. Bul. 185 (1914), pp. 367-471*).—Analyses are reported of alfalfa meal, blood meal, tankage, dried-beet pulp, corn bran, corn chop, cracked corn, corn-feed meal, corn-germ meal, hominy feed, cotton-seed meal and feed, oil meal, rolled oats, rye feed, wheat bran, shorts, middlings, shipstuff, dried brewers' grains, dried distillers' grains, molasses feed, and various mixed and proprietary feeds.

Concentrated feeding stuffs and registrations for 1914, C. S. CATHCART (*New Jersey Stas. Bul. 271 (1914), pp. 3-85*).—Analyses are reported of the following feeding stuffs: Alfalfa meal, brewer's dried grains, buckwheat bran, buckwheat middlings, buckwheat offal, corn-feed meal, corn-and-cob meal, corn-germ meal, cotton-seed meal, cotton-seed meal and hulls, distillers' dried grains—corn and rye—dried-beet pulp, feeding flour, gluten meal, gluten feed, hominy feed, hominy meal, linseed meal, malt sprouts, meat meal and beef scrap, mustard bran, oat hulls, rye bran, rye middlings, shredded wheat, wheat bran, and wheat middlings, and various mixed and proprietary feeds. A discussion of the findings under the new law and other data are included.

Experiments on the nitrogen economy value of sodium acetate for ruminants, E. PESCHECK (*Biochem. Ztschr., 62 (1914), No. 3-4, pp. 186-218*).—Experiments of Weiske and Flechsigs in 1889 are discussed in which sheep were fed hay, peanut cake, potato starch, and sugar as a basal feed with approximately 80 gm. per day of sodium acetate, the addition of sodium acetate reducing the nitrogen output in the urine over that in animals fed on the basal ration alone. Later experiments by Gabriel in which salt was added to the

basal ration confirmed these results, the nitrogen output in the urine and feces being greater on the basal ration alone than when from 10 to 30 gm. of NaCl was fed with the ration.

The principles and practice of judging live-stock, C. W. GAY (*New York: The Macmillan Co., 1914, pp. XVIII+413, figs. 159*).—This book, which is one of the Rural Text-book Series, gives practical instruction in methods of judging live stock.

Stock breeding in Belgium, J. L. FRATEUR (*Vie Agr. et Rurale, 3 (1914), No. 24, pp. 666-672, figs. 2*).—This includes data on the importation and exportation of horses, cattle, sheep, and other classes of farm stock in Belgium, and an account of the status of live stock breeding in that country.

The cattle of Demonte, E. MASCHERONI (*Indus. Latt. e Zootec., 12 (1914), No. 19, pp. 292-295, figs. 5*).—An account of the origin, breed characteristics, and utility value of the breed of cattle indigenous to Demonte, Italy.

Cattle feeding on the plantation and farm, W. H. DALRYMPLE (*Louisiana Stas. Bul. 151 (1915), pp. 3-13, fig. 1*).—This bulletin is a general discussion of the opportunities for successful cattle feeding in Louisiana, especially on the sugar plantation where molasses and cane-top silage may be used to advantage. The experience of one feeder is cited in which 49 lbs. of corn silage, 6 lbs. of blackstrap molasses, and 5 lbs. of cotton-seed meal per head per day were fed 111 days, a net profit of \$6.52 per head being realized.

Digestion and metabolism of a steer when placed on a continuous ration of corn silage, P. V. EWING and C. A. WELLS (*Georgia Sta. Bul. 109 (1914), pp. 145-158, figs. 3*).—In a digestion experiment with a 14-month-old Shorthorn steer in which eight 10-day trials, with periods of about seven days intervening, were made, and in which he was fed all the silage he would eat twice daily, this being regarded as about a maintenance ration, average digestion coefficients were obtained of 61.3 per cent for dry matter, 27 for nitrogen, 51 for fat, 62.4 for nitrogen-free extract, 69 for fiber, and 42.2 for ash. It was demonstrated that "when an animal is placed on a low plane of nutrition it does not more completely digest the feed given it as time goes on. The tendency seems to be slightly in the opposite direction. Not only is digestion quite uniform in its intensity in different individuals of the same species, but with the same animal it remains fairly constant when taken over a rather long period of time.

"The digestibility of the feed is somewhat retarded in an animal after having been on a low plane of nutrition for a time, which is probably the result of a general retardation of the digestive functions. The maintenance ration of a steer does not decrease as time goes on through the steer's ability to take more of the nutrients from the feed given him, but by virtue of his physiological behavior the steer puts the digested nutrients supplied him to a more economical use.

"Silage alone is an unsatisfactory feed because of its deficiency in nitrogen, and a steer placed on this ration is forced to draw on his stored nitrogen to meet the demands of the body for nitrogen. While the animal was eating all the silage its appetite would permit, there was every indication that it could have digested more silage if it could have consumed it. The appetite seems to act in some way as a check on the efficiency of the animal.

"Water consumption seems to be very greatly influenced by the moisture content of the feedstuff, and it is possible for the water of a succulent feed, such as silage, to supply all the water required by a steer for at least a number of days. The disposition of an animal is materially affected by being placed on a low plane of nutrition, as indicated by restlessness, nervousness, inclination toward viciousness, a very abnormal appetite, constant grinding of the

teeth, and a drawn or humped attitude when standing. After having been starved or stunted for a period this animal was apparently able to overcome the effects, which suggests that an animal has the capacity to increase its rate of gain for a short period of time, at least, in order to compensate for a low rate at some previous period."

[Feeding preserved milk to calves], G. A. BROWN (*Michigan Sta. Rpt. 1914*, pp. 206-210).—In trials to determine the advisability of using formaldehyde as a preservative for skim milk fed to 4 to 7-week-old calves for 24 weeks, 7½ cc. of 40 per cent formaldehyde being used to each 100 lbs. of milk, it was found that in general the calves suffered no deleterious effects from the preservative, and as compared with calves fed sweet milk or sour milk, made slightly greater gains at somewhat lower cost. From records kept of the after development of these calves it was found that those which had been fed the preserved milk continued to make the cheapest gains, followed by the sweet milk fed calves and the sour milk fed calves.

For the entire experiment the calves fed sweet milk made a total gain of 1,997 lbs., costing 5.41 cts. per pound; those fed sour milk 2,489.4 lbs., costing 5.43 cts. per pound; and those fed the preserved milk 2,537 lbs., costing 5.23 cts. per pound.

It is concluded, however, that the work should be carried on with a large number of calves before definite conclusions can be drawn.

The characteristics of the hybrid zebu, C. PUCCI (*Agr. Colon. [Italy]*, 8 (1914), No. 10, pp. 613-619, pls. 3).—Experiments are reported in crossing the zebu on various Italian and European breeds of cattle. The hybrid showed greater resistance to disease, earlier maturing qualities, and more marked beef qualities.

Rations for breeding ewes, H. HACKEDORN (*Missouri Sta. Bul. 120 (1914)*, pp. 31-57, figs. 9).—Lots of 2 to 4-year-old Colorado ewes, weighing approximately 86 lbs., were fed during the winter season with the results shown in the following table:

Summary of ewe-feeding experiments.

Ewes.									Lambs produced.				
Lots.	Feeds.	No.	Average initial weight.	Daily rations.				Average loss or gain.	Strong.	Weak.	Dead.	Average live weight.	Average daily gain 30 days after birth.
				Grain.	Hay.	Silage.	Stover.						
1	Clover hay and grain.....	14	Lbs. 92.75	Lbs. 0.33	Lbs. 2.99	Lbs.	Lbs.	Lbs. 6.53	16			Lbs. 8.98	Lbs. 0.534
2	Timothy hay and grain....	15	91.73	.35	2.91			-7.67	11	5	1	8.48	.447
3	Grain and clover hay.....	10	81.69	.56	2.94			3.21	10	1		8.98	.319
4	Clover hay.....	10	79.72		3.27			-3.20	9		1	8.16	.204
5	Corn silage and grain.....	21	83.36	.43		3.42		1.18	20	1		9.37	.389
6	Corn stover and grain.....	26	86.17	.503			6.16	-.83	26		2	9.29	.388
7	Corn silage and clover hay.....	25	86.75		1.87	2.36		-2.63	25	4		8.62	.308
8	Corn stover and clover hay.....	27	84.80		2.31		2.32	-2.06	24	4	1	8.27	.308
9	Corn silage, clover hay, and grain....	20	88.24	.45	2.079	2.09		4.26	24	1		8.698	.398
10	Corn stover, clover hay, and grain....	24	87.89	.397	1.86		2.35	-.31	23	3		9	.384

The results are summarized as follows:

"Clover hay and grain proved more efficient as a ration for breeding ewes than timothy hay and grain. Clover hay alone was sufficient to maintain pregnant breeding ewes up to lambing time. After lambing, the addition of grain to the ration proved advisable.

"Corn silage when fed with clover hay, with grain, and with both clover hay and grain, proved a slightly better roughage than corn stover fed with the same combination of grain and clover hay. Moldy or extremely sour corn silage is a dangerous feed for sheep. Eleven ewes were lost in this experiment in one week from accidentally feeding moldy silage. A ration of corn silage, clover hay, and grain proved to be the most efficient means of utilizing silage.

"A ration of grain and corn stover gave very satisfactory results when sufficient and proper kinds of concentrates were used. Corn stover, clover hay, and grain proved to be the most satisfactory method of utilizing stover. Corn silage and stover both proved to be better roughages than timothy hay when fed with grain."

A table is given showing the capacity for sheep feeding of silos ranging in capacity from 45 to 314 tons.

A survey of sheep and lamb production in 1914, R. M. MURPHY (*Tennessee Sta. Bul. 110 (1914), pp. 248-264, figs. 2*).—This bulletin is a general discussion of the sheep industry in Tennessee and includes sections on the extent of the industry, causes of increase and subsequent decline, kinds of sheep and sources of supply, system of management, marketing the crop, clipping and marketing wool, lamb and wool clubs, dogs, needs of the sheep industry, and a suggested dog law.

Silage for horses and mules, E. A. TROWBRIDGE (*Missouri Sta. Circ. 72 (1914), pp. 29-32, fig. 1*).—Ten yearling mules, weighing approximately 650 lbs. each, were fed for 90 days an average daily ration of 6.5 lbs. of ear corn, 8.6 lbs. of mixed hay, and 4 lbs. of corn silage. The mules made a gain of only 4.8 lbs. during the period. No ill results were seen from the use of the silage but the mules did not consume large quantities of it. This it is thought may have been due to the fact that the silage was made from rather immature corn.

Successful experiments in feeding silage to horses and mules, conducted at the North Carolina and Pennsylvania stations (E. S. R., 15, p. 901; 28, p. 172; 29, p. 773) are cited. It is advised that corn silage should always be fed in combination with other feeds, and that under no circumstances should spoiled silage, either moldy or rotten, be fed to horses and mules.

Studies on the physiology of reproduction in the domestic fowl.—VIII, On some physiological effects of ligation, section, or removal of the oviduct, R. PEARL and MAYNIE R. CURTIS (*Jour. Expt. Zool., 17 (1914), No. 3, pp. 395-424*).—The authors summarize the results of their studies as follows:

"Neither the ligation, section, nor entire removal of the oviduct causes the degeneration or prevents the further growth of the ovary. The pressure of the inclosing funnel is evidently not necessary to ovulation since yolks are ovulated into the body cavity after the ostium is sewed or ligated or after the entire duct is removed. Internal pressure due to continued yolk formation is probably the most important factor in the normal rupture of the follicle, since closing the funnel or removing the duct apparently does not greatly delay ovulation. There are cases of unoperated birds with normally functioning ovaries, and oviducts apparently capable of functioning which do not produce eggs because of some anatomical or physiological condition of the mouth of the oviduct which prevents the entrance of the yolk.

"The fate of yolks or eggs set free in the body cavity depends apparently upon the physiological vigor of the bird. First, they may cause serious metabolic disturbances which result in the death of the bird; second, they may be absorbed rapidly from the general peritoneal surface; or third, they may be walled off by the peritoneum and then absorbed. The material from the resorbed yolks or eggs is apparently utilized in body metabolism since all such birds which were in good health at the time of autopsy were very fat. The removal of the greater portion of an oviduct does not cause the atrophy of any remaining portion. The whole or any remaining part of an oviduct sewed at the funnel, ligated at any level, or with parts removed, passes through growth and cyclic changes coordinated with changes in the ovary exactly as an unoperated duct.

"The stimulation of the advancing egg is necessary for the discharge of the secretion of the duct, since a duct closed at any level functions only to the point where the passage is interrupted. When any portion of the ventral ligament is removed it is not replaced but all remaining portions develop. The forward portion of the ventral ligament is necessary for the reception of the yolk by the funnel. The muscle bundles which arise from the muscular cord in the ventral ligament along the uterus are probably an important part of the normal apparatus which expels the egg."

Studies on the physiology of reproduction in the domestic fowl.—IX, On the effect of corpus luteum substance upon ovulation in the fowl, R. PEARL and F. M. SURFACE (*Jour. Biol. Chem.*, 19 (1914), No. 2, pp. 263-278).—In these studies it was shown that "the desiccated fat-free substance of the corpus luteum of the cow, when injected in suspension, in proper dosage, into an actively laying fowl immediately inhibits ovulation. The duration of this effect varies with different birds from a few days up to two to three weeks. After the bird begins ovulating again the laying goes on unimpaired. The same effect is produced by the injection of extracts of the luteal substance, either intravenously or intra-abdominally. The active substance in producing the inhibition is inactivated by boiling." It is stated that these results are of interest zoologically as well as physiologically. It suggests the possibility of finding a chemical substance which will stimulate or activate the ovulation mechanism. Also, "the fact that the same chemical substance inhibits ovulation in mammals and birds, which latter do not possess any organ corresponding to the one which produces the substance in mammals (the corpus luteum) suggests that natural selection probably had nothing to do with the evolution of either the organ or the function in the mammals."

Studies on inheritance in poultry.—II, The factor for black pigmentation in the White Leghorn breed, P. B. HADLEY (*Rhode Island Sta. Bul.* 161 (1914), pp. 449-460, pl. 1).—This is a continuation of work previously noted (E. S. R., 30, p. 71).

The author demonstrates that the White Leghorn carries in itself all the factors necessary for the production of black pigmentation in the F_2 and later generations of crosses with any nonblack race. In these experiments the stock used was pure White Leghorn and White Plymouth Rock, line-bred for many generations. The crosses were made in only one direction, White Leghorn male \times White Plymouth Rock females. The majority of the birds were raised to five months of age, and some were kept until they were mature. On the basis of the hypothesis that the White Leghorn does not carry the factor, or factors, for black pigmentation, but contributes only one of two necessary factors, while the White Plymouth Rock contributes the other, there was a wide departure in the actual results from the expected results; while on the

basis of the hypothesis that the White Leghorn carries in itself all the factors for black pigmentation, the actual and expected results corresponded very closely.

The results of this study indicate that the admixture of Leghorn blood can not be made without introducing complexities in either pattern or color.

Seaweed for packing birds, M. DEKOBRA (*Nature [Paris]*, 42 (1914), No. 2134, pp. 339-340, figs. 5; *abs. in Internat. Inst. Agr. [Rome]*, Mo. Bul. Agr. Intel. and Plant Diseases, 5 (1914), No. 7, p. 918).—A new method of packing birds is described, which consists "in placing the body in a natural bag formed by the lamina of a certain seaweed occurring in islands off New Zealand. Birds can be kept in good condition for several years in this way."

DAIRY FARMING—DAIRYING.

Report of the dairy husbandry department, O. F. HUNZIKER (*Indiana Sta. Rpt. 1914*, pp. 37-47).—In continuing work previously noted (*E. S. R.*, 30, p. 575) three lots of five cows each were fed for six months corn silage and alfalfa as roughage and a grain ration as follows: Lot 1, corn meal, wheat bran, and cotton-seed meal 4:2:1 by weight; lot 2, ground corn and wheat bran 1:1; lot 3, ground corn and oats 1:1. The gains in weight per head were, respectively, 19.64, 19.8, and -7.56 lbs., the milk yields approximately 1,435, 1,409.7, and 1,430 lbs., the milk fat yield 57.6, 56.72, and 56.86 lbs., the total dry matter consumed per pound of milk 0.97, 0.99, and 0.94 lb., and the average daily cost of feed 21.1, 20.7, and 20.5 cts. per head. The cost per pound of fat was 22.1, 22.2, and 22.5 cts., respectively.

It is concluded that the use of wheat bran or ground oats in a dairy ration is to be recommended, although the selection should depend largely upon its availability.

In an experiment in which three lots of six or seven calves were fed for 42 weeks as follows: Lot 1, an average of 11.2 lbs. skim milk per head per day; lot 2, 1.41 lbs. per day of home-mixed calf meal consisting of hominy meal, linseed meal, red dog flour, and dried blood equal parts by weight; and lot 3, 1.06 lbs. per day of a commercial calf feed, all of the lots receiving whole milk until gradually displaced by the other feeds, and also receiving a dry mash and a roughage feed of alfalfa hay and silage, the average daily gains per head were 1.26, 1.04, and 0.78 lbs., the average daily cost of the ration 7.1, 7.4, and 9.67 cts., and the cost per pound of gain 5.6, 7.2, and 13.6 cts., respectively. This experiment is being continued.

In order to determine the accuracy of the different methods of sampling milk, including daily samples, composite samples with aliquot portions or equal portions, samples every second day, every third day, every fourth day, and every fifth day, tests were made of 4,900 of samples taken by these methods. The averages of the percentages of fat and pounds of fat of all samples and for the entire 14 days show "a remarkable uniformity of results secured by the several methods."

Report of an experiment on the feeding of dairy cows, T. MILBURN and R. RICHARDSON (*County Council Lancaster, Ed. Com., Agr. Dept., Farmers' Bul. 28 (1915), pp. 13*).—An analysis of palm-nut cake is given as moisture 12.29, protein 18.79, fat 6.87, carbohydrates 48.84, fiber 9.51, and ash 3.7 per cent.

Two lots of six cows each were fed by the reversal method for two months a basal ration of roots, meals, and hay, lot 1 receiving daily in addition from 4½ to 5 lbs. of decorticated cotton cake, and lot 2 from 6½ to 7½ lbs. of palm-nut cake. The cotton-cake fed lot yielded a total of 8,852 lbs. of milk during the

experimental period, while the palm-nut cake fed lot yielded 8,743.25 lbs. In every case where there was a change to palm-nut cake a drop in yield occurred, whereas in cases of changes to cotton cake there were two increases and two decreases. The change in feed did not materially affect the composition of the milk, and the palm-nut cake, though fed in fairly large quantities, had no undesirable effects on the butter produced.

It is stated that palm-nut cake is a perfectly safe feed for milch cows, and might give better results if fed as a part of the cake portion of the ration (2 to 3 lbs.) than were obtained in this experiment where one cake only was introduced.

Murne Cowan, new world's champion [cow], R. G. MURPHY (*Hoard's Dairyman*, 49 (1915), No. 7, p. 247, figs. 3).—An account of the 10-year-old Guernsey cow, Murne Cowan, which has recently completed her year's record of 24,008 lbs. of milk containing 1,098.18 lbs. of fat. Her largest milk yield in 24 hours was 82.3 lbs. In seven days she produced 565.8 lbs. of milk containing 24.44 lbs. of fat and in one month she produced 2,361.5 lbs. of milk and 102.02 lbs. of fat. It is said that Murne Cowan weighs 1,320 lbs., 100 lbs. more than when the test was begun, and that to all appearances the making of this record has not injured her in the least.

Experiments with the Sharples mechanical milker, J. J. HOOPER and J. W. NUTTER (*Kentucky Sta. Bul.* 186 (1914), pp. 475-510, figs. 12).—In tests with milking machines at the Kentucky Station it was demonstrated that there was no appreciable or permanent decrease in the milk production during a 30-day period when the cows were becoming accustomed to the mechanical milker.

At the Elmendorf farm, Lexington, Ky., it was found that 25 cows milked with the machine decreased 10.5 per cent in their milk yield in May as compared with their production in February, while 25 other cows during the same period milked by hand decreased 18.5 per cent. The machine-milked cows produced less milk during March than during April. After the machine at the station had been in use for seven months, it was discontinued for two weeks and the cows during that period were milked by hand. The cows did not as a rule respond with a larger milk yield when hand milked. The cows were stripped by hand after being machine-milked, the average strippings amounting to less than one pint.

The average percentage of decrease in milk yield for each period of 30 days was found to vary from 3.4 per cent in the second month to 21.5 per cent in the twelfth month. This decrease is somewhat larger and was not so uniform as was found in 323 animals at the Wisconsin Station (E. S. R., 28, p. 272).

An average of 71 milkings showed that the time consumed by a unit in milking a cow was 3.99 minutes, the time to strip 0.83 minute, the weight of strippings 0.92 lb., and the milk produced with strippings added 11.67 lbs.

It was found that two men operating four units can milk 28 cows, strip and feed them, and carry the milk to the dairy room in 43.4 minutes. With hand milking this same operation performed by two men required 1 hour and 20 minutes. The total time consumed in washing the parts of the machine each day was 75 minutes.

Salt brine and sal soda solutions were found unsatisfactory in cleaning the parts of the milking machine. A solution consisting of unslaked lime and water 1:9 is now used and found to kill practically all bacteria.

Bacteriological tests made of the various solutions showed that whereas those using brine and sal soda contained a large number of bacteria, limewater contained from 0 to 130 bacteria per cubic centimeter. Bacteriological tests made of milk produced with the machine showed an average of 3,657.6 bacteria

per cubic centimeter, and where the strippings were added, an average of 12,221.5 bacteria per cubic centimeter. Tests on average milk from the station dairy showed 10,620 bacteria.

A comparison of hand and machine milk showed a somewhat lower bacterial content in the latter. In comparing the tests of milk drawn with the machine from many different cows it appeared that some cows produced milk that contained a large number of bacteria, but ordinarily the milk was almost free from bacteria as it came from a healthy udder. It was found advisable to draw a stream of milk from each teat before the cups are applied as this milk contains a large number of bacteria. A high bacterial count followed lapses in scrupulous cleanliness in handling the machine and its parts.

Development and present situation of milk recording and bookkeeping associations in Denmark, A. C. DUBORG (*Abs. in Internat. Inst. Agr. [Rome], Mo. Bul. Agr. Intel. and Plant Diseases*, 5 (1914), No. 9, pp. 1234-1236).—An account of the work of the milk-recording associations in Denmark.

[Prices paid to farmers for milk] (*Cream. and Milk Plant Mo.*, 3 (1915), No. 6, pp. 23, 24, fig. 1).—From statistics compiled by the Dairy Division and the Bureau of Crop Estimates of this Department it is estimated that the average price paid to farmers for milk in 1913 was 3.849 cts. per quart, and in 1912, 3.565 cts. The price decreased from 4.2 cts. in January to 3.3 cts. in June and then gradually increasing to 4.3 cts. in December. It appears that milk was at its highest in New England, the average price for the year being 4.571 cts. It was lowest in the east North-Central States, the year's average being 3.503 cts. The greatest range in prices was found in the Middle Atlantic States, where the December price was 4.187 cts. and the June price 2.912 cts.

Studies on milk, R. WINDISCH (*Kisérlet. Közlem.*, 17 (1914), No. 2, pp. 221-223).—In these studies a variation in the dry matter in the milk of morning and evening milkings from 0 to 0.1 per cent was noted in 75.47 per cent of the cases, from 0.1 to 0.2 in 21.69 per cent, and greater than 0.2 per cent in 2.81 per cent of the cases. The Ackermann refraction was found to be a fairly accurate method of distinguishing the milk from cows of fresh lactation from those well along in the lactation period.

Bacillus abortus in market milk, ALICE C. EVANS (*Jour. Wash. Acad. Sci.*, 5 (1915), No. 4, pp. 122-125).—A method by which *B. abortus* may be isolated and identified is described as follows:

"The milk is plated on ordinary lactose agar, to which there is added just before pouring into the plate, at a temperature of about 50° C., 10 per cent of sterile blood serum. After incubating for four days at 37°, a certain area of the plate, large enough to include several colonies of *B. abortus*, should they be present, is selected, and the colonies are transferred to a nutrient broth containing 1 per cent of glycerin. Colonies from a similar area are transferred to tubes of whole milk containing litmus.

"The growth in the glycerin broth is quite characteristic. There is a medium amount of growth in tiny, compact, spherical masses which settles to the bottom of the tube and does not cloud the broth. In litmus whole milk there is an abundant growth in the cream layer, with a gradual development of acid. Cultures in litmus milk from which the cream has been removed grow sparingly, with no apparent effect. On plain infusion agar slopes the growth is in very small, separate colonies, which are scattered over the whole surface of the slope, if it happens to be moist at the time of inoculation; or the colonies are confined to a ribbon-like growth along the line of inoculation, if the agar is comparatively dry when inoculated."

The incidence of tuberculosis in childhood.—The prevalence of tubercle bacilli in the Edinburgh milk supply, A. P. MITCHELL (*Jour. State Med.*, 23

(1915), No. 2, pp. 44-54).—Samples of milk collected from Edinburgh milk shops show a high incidence of tubercle bacilli, which fact is thought to account for the prevalence of bovine tubercular infection of children in that city. More stringent inspection and regulation of dairy farms is urged.

The viability of the typhoid bacillus in sour cream, C. KRUMWIEDE and W. C. NOBLE (*Amer. Jour. Pub. Health*, 4 (1914), No. 11, pp. 1006-1008).—This investigation tends to show that the acids produced in sour cream gradually kill the typhoid bacillus, at a rate proportional to the degree of acidity and the number of organisms present.

"With a moderate contamination, the typhoid bacilli are killed in about four days. With a heavy contamination or where initial multiplication has taken place, a longer time may be required. For this reason a clean cream which soured slowly would be more dangerous if contaminated, as an initial multiplication of the typhoid bacilli would occur and a longer time would be required to destroy the bacilli."

An investigation into the keeping properties of condensed milks at the temperature of tropical climates, W. W. O. BEVERIDGE (*Jour. Roy. Army Med. Corps*, 22 (1914), No. 1, pp. 1-8).—The author concludes from his observations that "the change in color of certain kinds of condensed milks in tropical climates is presumably due to brown color being developed by reducing sugars in solution at a certain temperature, and is likely to be more marked with an increase of acidity due to bacterial fermentation; the presence of iron in the ferric state also plays a part in the production. In sterile condensed milks, chiefly found among those brands which contain no added sugar, changes are not noticeable. Sterile uncondensed tinned milk also shows no change even after incubation at 37° C. (98.6° F.) for many months.

"The increase of acidity is brought about by bacterial activity resulting from the increased temperature, and hydrolysis of the sugar follows. The bacteria concerned in the change are spore-bearing bacilli which produce an acid fermentation of the proteins. In milks containing only Gram-positive staphylococci a brown color is probably never produced. It would seem that the depth of the brown color is dependent on the amount of reducing sugar produced or of iron present, and is likely to be more intense in sweetened milks, owing to the reduction of the added cane sugar.

"The increase in consistency, noticed in connection with the brown coloration in sweetened milks, is also due to bacillary fermentation, and some of the protein is consequently rendered insoluble."

[Butter analyses], J. C. BRÜNNICH (*Ann. Rpt. Dept. Agr. and Stock [Queensland]*, 1913-14, pp. 65, 66).—Analyses of a large number of butter samples gave an average moisture content of 14.97 per cent for salted butter and 15.69 per cent for unsalted. There was 0.44 per cent of boric acid in the salted butter and 0.27 per cent in the unsalted.

Moldiness in butter, C. THOM and R. H. SHAW (*U. S. Dept. Agr., Jour. Agr. Research*, 3 (1915), No. 4, pp. 301-310, fig. 1).—From mycological and chemical examinations made of characteristic samples representing the range of conditions and appearances found in commercial butter obtained through the inspection service of this Department, the authors conclude that "mold in butter usually takes three forms, viz, (a) orange-yellow areas with a submerged growth of mycelium are produced by *Oidium lactis*; (b) smudged or dirty green areas either entirely submerged or with some surface growth are produced by species of *Alternaria* and *Cladosporium*; (c) green surface colonies are produced by species of *Penicillium*, or, more rarely, *Aspergillus*, either upon the butter, causing decomposition, or upon the container or wrappings, injuring the appearance of the sample in the market.

"Species of *Oidium*, *Alternaria*, and *Cladosporium* can not develop in butter containing 2.5 per cent of salt. The occurrence of any of these forms in a sample of butter indicates low salting. Excess of curd favors mold growth. Well-washed butter is less subject to mold. Leaky butter, i. e., butter from which water of buttermilk exudes and collects in the wrappings or in the container, furnishes the best conditions for the beginning of mold growth. From these wet areas colonies may spread to the butter itself.

"Wet surfaces, wet wrappings, or high humidity, are essential to mold growth in butter. Mold will not grow upon the surface of a piece of butter exposed to humidities of 70 per cent or lower. The water in the butter is thus not sufficiently available to the mold to support the development of a colony, unless evaporation is reduced by high humidities. In closed packages, wet or damp cellars, or carelessly packed masses with cracks or fissures in which moisture collects, mold may seriously injure the appearance of butter packages or actually induce great changes in the butter itself. Salt up to 2.5 to 3 per cent in butter is sufficient to eliminate mold or reduce it to negligible amount. This is equivalent to the use of a 12 to 15 per cent brine."

A bibliography of ten references is given.

VETERINARY MEDICINE.

A system of veterinary medicine, edited by E. W. HOARE (*Chicago: Alexander Eger, 1915, vol. 2, pp. XVIII+1623*).—This second volume of the work previously noted (*E. S. R.*, 29, p. 476) deals with general diseases and includes a section on parasites and parasitic diseases. An index to the two volumes is given.

Report of the veterinary department, R. A. CRAIG (*Indiana Sta. Rpt. 1914, pp. 72-76*).—During the year 38 per cent more of antihog-cholera serum was prepared than in any previous year. In the field work all healthy hogs were vaccinated by the serum-simultaneous method and the cholera hogs were given the serum alone. Many deaths resulted amongst the vaccinated healthy hogs due to infection of the vaccination wound at the time of vaccination or shortly afterward.

A few of the simultaneously vaccinated herds lost their immunity in from six weeks to six months post vaccination. In nearly every case the pigs that lost the immunity received only 0.5 cc. of hog cholera blood. "Field experience indicates that it is not advisable to administer less than one cc. of virus, or simultaneously vaccinate pigs that weigh less than 50 lbs., especially if the mother is actively immune."

In the hog cholera investigations hog cholera blood and virulent normal salt solution were studied with the ultramicroscope and various culture media such as milk, hay, and meat infusions, bouillon, and sugars were used in combination with filtrates of virulent blood. More than 60 germ-free filtrates were studied.

For the purpose of determining variations in the virulence of hog cholera blood at different periods in the disease, virus was secured by tail bleeding a cholera hog four and six days after it had been inoculated. Twelve pigs given the four-day virus lived an average of 24 days while those given the six-day virus lived only 21 days.

A mixture consisting of one part hog cholera blood and two parts normal salt solution was incubated at a temperature of 37.5° C. for 24 hours. The different lots of virus were then heated from one to two hours in a water bath at temperatures ranging from 60 to 65°. Of 62 pigs inoculated with

the heated virus, 60 of the pigs died of acute hog cholera, while of 23 pen exposure checks, 21 died of hog cholera.

Inoculation by the intravenous method was found to yield a less potent antiserum than that given when the inoculation of virus is made intramuscularly. Ten hog cholera cures (nine proprietary and sodium cacodylate) were tried, but no preventive or curative properties were found.

"Samples of the different antihog-cholera sera sold by the commercial firms have been bought and tested for both potency and purity. The bacterial counts of the different makes of serum have varied from 30,000 to 125,000,000 bacteria to the cubic centimeter. Forty tests for potency have been made. Thirteen of these tests proved unsatisfactory, one or all of the pigs in the different tests that were vaccinated by the simultaneous method dying of hog cholera." From a large number of post-mortem examinations of birds from different poultry farms in the State and the reported losses, it is concluded that mixed septicemia causes more loss to poultrymen than any other one disease. An attempt to control this infection on one poultry farm by the use of a bacterin failed.

Report of the bacteriologist, W. GILTNER (*Michigan Sta. Rpt. 1914, pp. 210-225*).—In a study of the milk of animals infected with contagious abortion organisms having a close resemblance to the *Bacillus abortus* were isolated from the stomach of an aborted calf and from the milk of a cow after abortion.

As to the comparative virulence of avian, human, and bovine types of *B. tuberculosis*, the results of a rabbit experiment "would lead one to believe a close relationship exists between the avian and bovine types as regards the degree of virulence. Furthermore, if the type of disease produced in rabbits is indicative of the type that might be produced by the application of the same methods in calves, the use of living cultures of avian tubercle bacteria in bovine vaccination is unsafe and unwarranted."

In studying contagious epithelioma or "sore head" in chickens, a vaccine was prepared "from the diphtheritic membrane which developed in the mouth of the diseased birds. This material was ground in a sterile mortar, suspended in salt solution, and heated at 60° C. for two hours. Injections of 1 cc. were made into the muscles of the leg in some cases and the breast in others. Twelve birds were treated and one not treated was placed in a pen with those treated. This untreated bird died later and an autopsy showed a diphtheritic condition of mouth, larynx, and pharynx. Those birds which were sick when treated all recovered with but one exception. One of the sick treated birds was kept in the pen and later the disease redeveloped, about two months after apparent recovery. This would indicate an immunity of short duration."

In work on contagious abortion, an additional experiment was made to study the effects of dead and living cultures of the abortus bacterium upon the morphological blood elements "and blood reactions, both in open females and during pregnancy, a study of the pathologic anatomical changes as a result of these culture injections." It was found from a comparative study of the agglutination and complement fixation test that little can be determined from these tests about the probability of an individual aborting, nor can anything be predicted as to the probability of the reacting animal becoming a source of danger to susceptible animals. "The complement fixation test will pick out more reactors than will the agglutination test but on the other hand animals may react to the agglutination test and not to the complement fixation test. . . . The use of living cultures of the abortus bacillus on open females and dead cultures on pregnant females has been applied to a few herds with the object of observing their immunizing effects. The results of this work can not be fully appreciated as

yet but they are not encouraging, on the other hand they lead to the belief that these injections may result injuriously in some cases and beneficial in others."

Annual report of the Bengal Veterinary College and of the Civil Veterinary Department, Bengal, for the year 1913-14, A. SMITH and P. J. KERR (*Ann. Rpt. Bengal Vet. Col. and Civ. Vet. Dept., 1913-14, pp. 6+III+9+VIII+3*).—This is the usual annual report (E. S. R., 30, p. 778).

E. Merck's annual report of recent advances in pharmaceutical chemistry and therapeutics (*Merck's Ann. Rpts., 27 (1913), pp. 589*).—This is a review of the literature pertaining to these topics for the year 1913. Special articles on nuclein and nucleic acid and preparations used for radiographic examinations are included. A bibliographic index is appended.

Bacterial antiferments.—Studies on ferment action, **XVII**, J. W. JOBLING and W. PETERSEN (*Jour. Expt. Med., 20 (1914), No. 5, pp. 452-467, figs. 2*).—This work was done with several kinds of bacteria, including the tubercle bacillus. Intact bacteria are said to resist digestion by trypsin because no protein substratum is exposed. Dried organisms resist digestion in a degree proportional to their content of unsaturated lipoids. Lipoidal extractives were found to reduce the resistance to tryptic digestion.

"The extracted lipoids (saponified) are antitryptic in a degree proportional to their unsaturation. The inactivation of the antiferment in Gram-negative organisms is probably due to changes in the degree of lipoidal dispersion. Bacteria adsorb lipoids from the serum when incubated at 37° C. Such organisms when dried are found to be more resistant to tryptic digestion than untreated organisms."

Lipoids as inhibitors of anaphylactic shock.—Studies on ferment action, **XVIII**, J. W. JOBLING and W. PETERSEN (*Jour. Expt. Med., 20 (1914), No. 5, pp. 468-476, fig. 1*).—"The antitryptic titer of the serum can be increased by subcutaneous injections of serum lipoids (antitrypsin) and of the lipoids from egg yolk. Animals so injected show a relative immunity to acute anaphylactic shock (two minimum lethal doses). Extraction of lipoids contained in antigens increases the toxicity of the antigen when injected into a sensitized animal. Sublethal doses of soap solutions injected simultaneously with the antigen (purified horse serum albumin) prevent anaphylactic shock. The refractory state following anaphylactic shock is related in part to an increase in the antitryptic titer of the serum."

An anomalous strain of *Bacillus paratyphosus* (B) and its source, H. J. HUTCHENS and W. J. TULLOCH (*Abs. in Jour. Path. and Bact., 18 (1914), No. 3, pp. 431, 432*).—An organism was isolated from brewers' yeast which had been used as a feed for various species of farmyard animals in which it appears to have produced symptoms of acute enteritis. The organism exhibited the usual morphological and biochemical characteristics of the *Salmonella* group but differed in its agglutination reactions.

Report on the investigation of four cases of sudden death which took place at the Athens State Hospital, E. R. HAYHURST and E. SCOTT (*Mo. Bul. Ohio Bd. Health, 4 (1914), No. 10, pp. 1407-1421, fig. 1*).—Autopsical findings are presented for four men, patients with minor degrees of psychoses at the Athens State Hospital, and 31, 56, 56, and 67 years old, respectively, who were suddenly asphyxiated within five minutes after entering a new metal silo being filled with corn silage. The men were employed to tramp down the silage, and were waiting for work to begin. In spite of efforts at resuscitation, including hypodermic injections of stimulants, it was impossible to revive any of them.

On the morning following the accident tests were made in the silo with guinea pigs, rabbits, and dogs, which succumbed in a few minutes. About half

an hour later, one of the investigators entered but could detect nothing peculiar until his head was about a foot above the silage, when pungent, warm, slightly alcoholic gas was noticeable. The odor of the gas gave no suggestion of bitter almonds, garlic, or rotten eggs. A second investigator discovered at about 10 in. above the general level of the silage, and from there to the silage the same almost irrespirable gas, which had an immediately irritating effect upon the mucous membrane of the nose, throat, and trachea.

Analysis of a sample of the gas collected from the silo showed carbon dioxid 38.15, oxygen 13.75, and nitrogen 48.1 per cent, while that of a sample obtained from a neighboring silo showed carbon dioxid 0.22, oxygen 20.6, and nitrogen 79.22 per cent. No test was obtained for carbon monoxid, ammonia, hydrocyanic acid, or methane.

A crisis in the foot-and-mouth disease situation (*Illinois Sta. Circ. 178 (1915), pp. 4*).—A discussion of the foot-and-mouth disease situation prepared by a committee of the station which emphasizes the fact that it is "the plain duty of all who have the welfare of the live stock interests at heart to unite in supporting the efforts of the federal and state authorities to eradicate the disease from this country."

Immunity against tuberculosis in cattle, A. CALMETTE and C. GUÉRIN (*Ann. Inst. Pasteur*, 28 (1914), No. 4, pp. 329-337; *abs. in Jour. Compar. Path. and Ther.*, 27 (1914), No. 3, pp. 263-265).—This is in continuation of work previously reported (*E. S. R.*, 30, p. 482) in regard to determining what part the substances which comprise the bacillus, i. e., the lipoids, the tuberculins, and the bacillary protoplasm, play in the production of immunity.

The lipoids appear to play no part in immunity, and the injection of tuberculin, either crude or precipitated, sensibly retards the development of tuberculosis produced by the test inoculations. The effect of intact bacilli killed by heat and washed was studied for the purpose of determining whether the slight protective power attributed to dead bacilli depends upon the tuberculin inclosed within the bodies of the bacilli.

"An 8-month-old calf was inoculated intravenously with 20 mg. of bacilli heated for 36 minutes at 65° C. and then washed with salt solution. Three months later the animal was tested with tuberculin and gave a very pronounced reaction. It was slaughtered on the same day, and at the post-mortem the lesions of chronic, slowly progressive tuberculosis were found."

"The intact bacillary protoplasm obtained from dead bacilli which are devoid of tuberculin possesses no immunizing action at all. Lasting tolerance possessed by bovines to infection with tuberculosis is due to the presence in their systems of living bacilli. The saprophytic existence of tubercle bacilli in the system leads to the production of soluble immunizing substances different from those obtained in artificial culture media."

The twenty-eight hour law and the animal quarantine laws annotated, compiled by H. GORING (*Washington: U. S. Dept. Agr., Office Solicitor, 1915, pp. 52*).—An annotation of the act of Congress approved June 29, 1906, commonly known as the "Twenty-eight Hour Law," and the Animal Quarantine Acts of May 29, 1884, February 2, 1903, and March 3, 1905. All of the decisions of the courts contained in the publication of October 2, 1908, entitled "The Twenty-eight Hour Law Annotated," all decisions under the Twenty-eight Hour Law reported since that publication was issued, and all decisions reported under the animal quarantine laws are included.

Sterility in bovines and equines, J. J. WESTER (*Tijdschr. Veeartsenijk.*, 41 (1914), No. 1, pp. 13-16; *abs. in Vet. Rec.*, 27 (1914), No. 1362, pp. 109, 110; *Cornell Vet.*, 4 (1915), No. 4, pp. 212, 213).—This article deals with endemic sterility which has been frequently encountered during certain years.

Dehorning cattle, P. V. EWING (*Georgia Sta. Bul. 111 (1914), pp. 193-204, figs. 7*).—A popular illustrated account.

The warble flies: Fourth report on experiments and observations as to life history and treatment (*Dept. Agr. and Tech. Instr. Ireland Jour., 15 (1914), No. 1, pp. 105-132, pls. 4, figs. 2*).—This is a report of investigations, conducted in continuation of those previously noted (*E. S. R., 24, p. 61*), which have extended up to the summer of 1914.

In the first part of the report New Facts in the Life History (pp. 105-119) are presented by G. H. Carpenter, T. R. Hewitt, and T. K. Reddin. It is pointed out that while *Hypoderma lineatum* lays her eggs on the hairs in rows and must, therefore, cling on for a few minutes while depositing them, *H. bovis* lays her eggs singly and quickly, thus causing the animals to get very excited. Studies of the external reproductive organs of *H. lineatum* and *H. bovis* show that they may be distinguished by very definite structural characters (*E. S. R., 31, p. 254*).

Up to the summer of 1913 the first-stage larva of the warble fly had not been observed outside the egg, but during that summer it was seen by Gläser in Germany (*E. S. R., 32, p. 60*) and by the authors in Great Britain. The so-called first-stage maggots mentioned by various authors as found in the gullets of cattle are in reality early second-stage larvæ.

"The newly-hatched maggot, though only 0.8 mm. ($\frac{1}{30}$ in.) long, is distinguished by the relatively immense strength of its mouth hooks, and of the spiny armature in transverse rows across its segments especially on the ventral aspect. . . . The whole aspect of this little larva suggests that it could bore as readily through the skin as through the mucous coat of the gullet. That it does bore into the skin we are convinced as the result of the muzzling experiments and of the direct observations that we have been able to make."

Muzzling experiments indicate that there is no protection from warbles for those calves which can not lick themselves, and confirm the opinion derived from the early muzzling experiments that the maggot usually enters the host's body through the skin. The experiments indicate that the tongue, far from aiding the parasite in its career, rather inhibits its progress and reduces the number of maggots found in animals that can lick themselves. In an experiment conducted during the summer of 1913 three of six calves kept housed and never allowed outside where they would be exposed to warble flies were fed 16 newly-laid *H. bovis* eggs each, the other three being kept as controls. All of the calves failed to develop warbles, thus telling strongly against the view that the parasites gain entrance to the host body by the eggs being licked in.

It is pointed out that the fly deposits its eggs almost exclusively on the legs, not confining itself to any particular part, but showing a decided preference—at least as regards *H. bovis*—for the heel or hock joint of the hind limbs. It was observed that a few days after the eggs had been deposited that a soreness appeared in the neighboring region of the skin which was followed by a discharge. "On looking with a lens at the skin near the newly-laid eggs, we saw that it was perforated with minute holes from which flowed a watery discharge, hardening on the surface to form a scaly deposit. After a day or two the region became covered with small pimples which disappeared a few days later. On squeezing the skin of the earliest 'case' that could be obtained, some clear watery fluid exuded from the holes, and on examining a smear of this under the microscope we were delighted to find a newly-hatched maggot of *H. lineatum*."

In an experimental attempt to verify these observations the authors clipped closely a small patch on the shoulder of a calf and placed seven maggots thereon. "Immediately they were put on the hairs they crawled down them to the skin and directed their bodies perpendicular to its surface. We soon

found that they were slowly disappearing into the skin, four were lost sight of, but the other three were watched cutting into the epidermis with their mouth hooks and occasionally bending the hinder region of their bodies until they disappeared completely. It took them about six hours to get into the skin; possibly hair follicles may have facilitated entrance. Next morning there were three little eruptions or pimples just where they had entered, and we found four other little pimples indicating where the other maggots which had been lost to view had also bored in. . . . These observations confirm the belief deduced from the muzzling results that the maggots enters the animal's body through the skin and not by the mouth and gullet.

"As the eggs are laid on the lower parts of the animals, seldom if ever on the back, and as the maggots, according to our observations, enter the skin somewhat below the position of the eggs, it remains to consider by what course the parasite finds its way to the back." The authors conclude that there is no reason why the maggots should not make their way through the host's body from the skin of the legs to the gullet and thence to the back. After having observed the entrance holes of newly-hatched larvæ in the skin two cows were slaughtered to trace their further course. A careful search in the skin and the underlying fatty and muscular tissues, however, failed to reveal any maggots. In no case could they be followed further than the superficial layers of the dermis. It is suggested that possibly the minute larva may enter a small vein and be carried in the blood stream, at least part of the way to the gullet.

Examinations were made of a large number of gullets and stomachs of cattle from the Dublin meat markets, and of 1,795 gullets examined 66 contained a total of 625 larvæ. The appearance of larvæ in the gullet was found to begin in August (on the twenty-sixth in 1914) and the number of affected gullets and of larvæ to increase until November, when the maximum is reached. "In December and January there is a slight decrease in the proportion of affected gullets, but the average maximum of maggots then becomes highest, and it is in these months that the maggots first appear beneath the skin of the back. In February when they become common in the latter position, the number in the gullet shows a marked decrease; in March hardly any are left there (our latest specimen was found on March 14), and from April until July, inclusive, no maggots were found in the gullet at all. These facts altogether support the view that the larvæ make their way to the gullet during the late summer and autumn, and leave it during the winter and early spring, traveling toward the region of the spine." The authors' observations indicate that the maggots wander to and fro along the gullet during the late autumn and winter. Seventy stomachs were examined between October 1 and February 28, but no warble larvæ were found in any of them. The authors consider their observation of second-stage larvæ just outside the muscular coat of the gullet, appearing as if they had bored through from the submucous coat, to be a new and most interesting one.

The second part of this paper on The Destruction of Warble Maggots (pp. 119-132) is by J. L. Duncan, T. R. Hewitt, and D. S. Jardine. Systematic destruction by squeezing out the "ripe" maggots has been continued up to the present time, the details relating to which are presented in tabular form.

In the experiments conducted with a view to discovering an effective dressing to be used for maggot destruction, it was found that sulphur dioxide gas applied under pressure to each warble for less than a minute kills 93 per cent of the maggots and causes no harm whatever to cattle.

Eradication of the cattle tick necessary for profitable dairying, J. H. McClain (*U. S. Dept. Agr., Farmers' Bul. 639 (1914), pp. 4, figs. 2*).—This is a popular account based upon the investigations previously noted (*E. S. R.*, 32,

p. 581), which emphasizes the importance of tick eradication to the dairy industry in the Southern States.

A contribution to the study of the treatment of bovine piroplasmosis by trypanblue, C. MELLIS (*Rev. Vét. [Toulouse]*, 39 (1914), No. 6, pp. 321-334).—Twenty-three cases of piroplasmosis in different degrees of severity were treated by the author through the use of trypanblue, it being administered subcutaneously in 20 cases in doses of from 100 to 160 gm. of the solution, both with and without pilocarpine, and intravenously in three in doses of 100 gm. with 0.08 gm. of pilocarpine. Nineteen of the cases responded to the treatment. The author points out that with all four animals that succumbed the drug was administered subcutaneously.

A text-book of the topographical anatomy of the horse, W. ELLENBERGER and H. BAUM (*Lehrbuch der Topographischen Anatomie des Pferdes. Berlin: Paul Parey, 1914, pp. IX+427, figs. 215*).—This text-book has been prepared from the author's large 3-volume work on the subject (*E. S. R.*, 9, p. 594) for use as a handbook by the veterinary student. The text of this work is shorter than that of the 3-volume work, but the number of figures remains the same, and a large number are in color.

Ophthalmic mallein for the diagnosis of glanders, J. R. MOHLER and A. EICHHORN (*U. S. Dept. Agr. Bul. 166 (1915), pp. 11, pl. 1*).—The mallein eye reaction is considered the most appropriate test for the use of the practicing veterinarian for the diagnosis of glanders. The combined agglutination and complement fixation method is considered a good laboratory test, as a check on the field tests and as a last resort in the diagnosis of doubtful reactors.

The ophthalmic test, which is simple to conduct, has been used with much success in Europe, especially in Austria. The reaction commences in from five to six hours after the instillation of the mallein, and lasts from 24 to 36 hours. The essential factor in obtaining satisfactory results is to use the proper kind of mallein. The mallein employed by the Bureau of Animal Industry was in concentrated form (raw mallein) and prepared by the Biochemic Division. The method of preparation is described. Dry mallein may also be used for the test but the solution for instillation must be prepared fresh each day. This form of mallein is used in the State of Pennsylvania for official work. The method of applying and interpreting the mallein test is described in detail and the description is accompanied by a copy of Quarantine Division Form 69, Record of Ophthalmic Mallein Test, used by the Bureau of Animal Industry. The effect of the test on glandered and healthy animals is discussed. Four reproductions of photographs are included to show the varying degrees of reactions.

The report of the special committee of the American Veterinary Medical Association and its conclusions, which are in accord with the findings of the bureau, are presented.

Contagious pneumonia.—Its treatment by neosalvarsan, R. BUNSOW (*Blood-stock Breeders' Rev.*, 3 (1914), No. 1, pp. 40-43; *abs. in Vet. Rec.*, 27 (1914), No. 1358, pp. 47, 48).—This article calls attention to the recent advances made in the treatment of pectoral influenza of equines through the use of neosalvarsan, which has much the same properties as salvarsan (dioxydiamidoarsenobenzol).

Hog cholera as a result of vaccinating against erysipelas, MÜLLER (*Berlin. Tierärztl. Wchnschr.*, 30 (1914), No. 13, *Beilage*, pp. 21-24).—A culture of erysipelas bacteria suspected of being the cause of hog cholera was tested upon 7- to 8-week-old shoats. Some were given the culture and others the filtrate from the culture, while another lot received blood serum, filtered and unfiltered, and organ pastes from affected animals.

The animals receiving the filtered and unfiltered cultures became affected with hog cholera, but the others did not. A number of the pigs which remained sound and some controls were fed with organs from the pigs which died from hog cholera and as a result of treatment with erysipelas culture, and others were placed in the infected stable. In both instances the animals became affected with hog cholera. The symptoms and pathological findings are briefly stated.

The curative action of autolyzed yeast against avian polyneuritis, E. A. COOPER (*Biochem. Jour.*, 8 (1914), No. 3, pp. 250-252).—"By the autolysis of brewers' yeast a solution can be obtained which possesses as marked curative properties toward avian polyneuritis as the original yeast. The solution retains its curative power for at least eight weeks and when given orally to birds in doses ten times as great as the minimum curing dose has no toxic action. Air-dried yeast retains its curative power after storage for two years in a dry tin, and still autolyzes after storage for four months."

House disinfection with formaldehyde; W. LÖWENSTEIN (*Ztschr. Hyg. u. Infektionskrank.*, 78 (1914), No. 2, pp. 363-384).—When formaldehyde was used for disinfection in the neighborhood of heated bodies the bacteria were killed with difficulty. Moist test objects were killed quicker than dry substances. Threads dipped in and saturated with bouillon cultures were more resistant to formaldehyde disinfection than agar cultures suspended in water. Formaldehyde acted in a similar manner on moist and dried bouillon culture test objects.

RURAL ENGINEERING.

Some measuring devices used in the delivery of irrigation water (*California Sta. Bul.* 247 (1915), pp. 111-180, pl. 1, figs. 31).—This bulletin, prepared under a cooperative agreement between the Irrigation Investigations of this Office and the University of California, describes the testing station at Davis, Cal., which is used for the purpose of examining, testing, and demonstrating the principal irrigation water measuring devices so far developed, and describes, illustrates, and points out the relative accuracy of some of the devices that have already become standard or that have been in use for a sufficiently long time or on a sufficient scale to warrant their installation at the laboratory.

Three measuring hydrants for underground distribution systems were tested. The Azusa hydrant provides for measurement through one or more orifices on the center of which a pressure head of 4 in. is maintained by means of a sheet iron spill crest set at right angles to the orifice plate. The hydrant is in the form of a concrete box placed over the supply pipe line and the area of the openings in the orifice varies from 10 to 50 sq. in. The average of all tests made on this hydrant showed "the amounts in inches being carried through the openings to be 1 per cent more than their area in square inches," including all errors in measurements. All openings or combinations of openings were equally accurate. It is thought, therefore, that the box will measure as accurately as is required.

The Gage hydrant consists of a main box of 2-in. mortar, the bottom of which is cast separately and the top cemented to it in the field. The weir crest consists of $\frac{1}{2}$ -in. by $1\frac{1}{2}$ -in. iron cemented to the sides, giving a final opening of 10 in. wide and $10\frac{1}{2}$ in. high. In the tests of this hydrant it was found that the amount of water discharged for any given depth was greater than with a standard 10 in. weir, owing to the nearness of the sides of the box to the sides of the weir and to the velocity conditions in the box. "The amount of this difference increases as the head increases, being as much as 35 per cent at the

higher heads." It is stated that the principal source of error in using this box in practice will be the difficulty in measuring the depth over the weir closely.

The Riverside box consists of a shallow box set over the end of the delivery pipe line. The water enters through the bottom of the box and is measured out through an adjustable cast-iron measuring plate in the end. In tests of this device the average difference between the number of inches actually received and the area in square inches of the opening was about 2 per cent. For all tests the area in square inches of the opening averaged 1 per cent greater than the inches actually received. It is thought that where care is used to adjust the width of the opening to the amount running this box will measure water very closely.

In tests of the Foote inch box the amount of water supposed to have been passed averaged 4 per cent greater than was actually run and the error did not vary with the amount of discharge. "From these tests it appears that the slide can be set within an average 4 per cent of correct if care is used. This box will measure water up to 150 in. satisfactorily under conditions to which it is adapted, although it is not in general an economical box to use."

A general discussion of different types of weirs in use is given, including weir tables which are in general use.

Submerged orifices are also described and tables developed by the U. S. Reclamation Service for determining their flow under different conditions are given. Tests of a submerged orifice 2 ft. wide and $\frac{1}{2}$ ft. high gave a coefficient of 0.61 which agrees with that determined by the Reclamation Service. In tests of a submerged orifice gate under two conditions it was found that the mean of all measurements using the level board gave a mean coefficient of 0.8 while the measurements on the gate gave a mean of 0.72. "From these results it is seen that the coefficient for such measuring gates varies with the type of gate. . . . Where the lack of sufficient fall for the use of a better measuring device makes the use of this type of submerged orifice necessary, a standard size and structure should be adopted, and special discharge tables prepared. This should then be rated under the condition in which it will be used."

Three mechanical devices for measuring and registering the total flow were tested. The Dethridge meter consists of a wheel or drum to which projecting pieces of sheet metal are fastened. The drum is placed with its axle horizontal and is so set that the projecting blades are in the current of the ditch to be measured. A special box is built around the wheel so that all water in passing has to strike against the blades. The tests of this device showed the meter to be quite accurate under constant ditch conditions between rates of flow of from 1 to 3.5 second-feet. For both larger and smaller discharges the meter passed more water than it did between these limits. "The amount of water going through the meter varies with the depth of drowning. A meter set high in the ditch will discharge less water per revolution than one set low. Checking up the ditch below a meter so that the depth is increased at the meter may increase the discharge by as much as 10 per cent in some cases. . . . The Dethridge meter of this size is adapted for accurate measurement of streams varying from 1 to 3 or 4 cu. ft. per second."

The Grant-Michell meter consists of a wheel turning in a horizontal circular opening through which the water is made to pass. The meter consists of four flat blades set so that the water in flowing through the circular opening strikes against them at an angle. On the upper end of the shaft carrying the wheel is a counter which records the number of revolutions of the wheel. Tests made of the 21-in. meter showed that for discharges of over 2 second-feet and up to 6.5 second-feet the meter makes one revolution for every 6.1 cubic feet of

water passed. More water is passed per revolution on lower rates of discharge. The tests show that the meter will probably register within 2.5 per cent of the true quantity. The fall required in the ditch varies with the rate of flow from about 1 in. for a discharge of 3 second-feet to 4 in. for a discharge of 5 second-feet. The high cost of this meter is said to be against its general use.

The Hill meter consists of a circular horizontal opening in the floor of a box through which the water to be measured is made to pass. The meter consists of curved vanes on a central drum. It sits in the center of the opening and is turned by the water as it strikes against the vanes on rising through the opening. The turning of the meter drives the gears of a counting device which records the water passed in acre-feet. Tests of a 12-in. Hill meter showed that this size of meter apparently registers the quantity passed within 1.5 per cent for discharges of from 1 to 3.5 second-feet. For discharges of less than 1 second-foot more water passed the meter than was registered and for discharges of 3.5 second-feet the water boiled up through the opening so as to submerge the counter. The loss of head of fall in the water required for this meter varied from 1 in. when carrying 1 second-foot to $6\frac{1}{2}$ in. when carrying 3.5 second-feet. "The Hill meter seems adapted to use under the usual conditions of irrigation practice. It is simple and has few wearing parts. The head required for the different sizes is less than that needed for the use of weirs. The record of the total quantity of water passed can be read in units of 0.001 acre-foot."

The data of the tests are given in an appendix.

Stream gaging by titration: Comparative tests of new chemical and standard mechanical methods of gaging stream flow, L. W. COLLET ET AL., trans. by G. BLAAUW and R. E. WARD (*Engin. and Contract.*, 42 (1914), No. 12, pp. 270-273, figs. 3).—This article explains the method of stream gaging by chemical means, describes the preparation of the solution, and the computation of results.

The process is based on the theory that if a constant quantity of concentrated solution of sodium chlorid be injected into a stream and samples of water taken at a certain distance from the point of injection into the stream, the discharge may be determined by the fact that the ratio of the discharge of the initial solution to the discharge of the final solution is inversely proportional to the ratio of their concentration. The conditions necessary for the success of this method of gaging are (1) a constant rate of flow of the initial solution, (2) perfect mixing, and (3) accurate titration of the salt solution.

Comparative tests made in Switzerland of the chemical method with the current meter, curtain, and weir methods are described, from which it is concluded that the titration method is rapid and exact, permits the easy determination of a discharge of high head turbines, is applicable in certain cases to test low head turbines, and may be used in gaging Alpine streams where other methods are considered inaccurate.

The hydraulics of irrigation, drainage, and other channels, L. SCHMEER (*Engin. and Contract.*, 42 (1914), No. 13, pp. 284-290, figs. 4).—The author briefly reviews the history of channel flow formulas, deduces an equation for circular conduits running full, discusses the practical application of formulas for conduits under pressure, and deals in more or less detail with formulas governing the flow of water in open conduits, covered aqueducts, and egg-shaped conduits.

Ground-water supplies, O. SMREKER (*Das Grundwasser, Seine Erscheinungsformen, Bewegungsgesetze, und Mengenbestimmung*. Leipsic: W. Engelmann, 1914, pp. 67, figs. 27; rev. in *Engin. News*, 72 (1914), No. 21, p. 1046).—This book is divided into seven sections which embrace a review of the principal

theories of the formation of ground water, the interchange of surface and sub-soil waters, the law of resistance to the motion of water through the ground, the efficiency of different methods of obtaining a water supply, the determination of the shape of the cone of depression of the ground-water surface by means of experiments with pumps, and the determination of the discharge of a stream of ground water through a given basin or cross section.

Economic factors involved in road construction in strictly rural sections (*Engin. and Contract.*, 42 (1914), No. 11, pp. 255-258).—This article considers the economics of country road construction from the standpoint of the general welfare of the community, discusses the relative permanence of construction and structural details, and describes methods of financing.

It is considered fundamental that any outlay of money be made in such a manner that it will result in a paying investment to the community. With this in view it is concluded (1) that no road should be improved without some provision for its maintenance, (2) that all unprofitable work and works "de luxe" be avoided within certain limits, (3) that all improvements not actually and positively needed be omitted or postponed, (4) that the choice of kinds of pavement the durability and ease of maintenance of which have not been ascertained in practice be avoided as much as possible, and (5) that unnecessary experiments be avoided.

The relation of farm produce hauling to permanent road improvements (*Engin. and Contract.*, 42 (1914), No. 9, pp. 215-217, figs. 2).—This article discusses economic questions relating to the classification of highways, hauling radius, apportioning of aid, supporting areas of cities, and cost of distributing food products, treating these subjects as fundamentals to economic road design under Ontario, Canada, conditions.

Concrete highway bridge construction as standardized by Iowa commission, C. B. McCULLOUGH (*Engin. Rec.*, 70 (1914), No. 19, pp. 514-517, figs. 6).—The author, in describing the process by which the Iowa Highway Commission has arrived at its standards for concrete highway bridges, states that topographical conditions markedly influenced the selection of designs for different parts of the State.

The cantilever type of abutment has been chosen for the general standard, but to meet conditions of scarcity of concrete materials in the Kansan drift area the pedestal or integral approach span type is being developed. The box type of culvert is said to have proved in general the solution of the culvert problem except in cases of very deep ravines requiring excessive fill, when the arch culvert is used.

Specifications and permissible stresses in material are given, and the standard superstructure plans were designed for the following loadings: (1) Dead loadings of earth fill at 120, concrete at 150, and brick masonry at 150 lbs. per cubic foot; treated timber at 5 and untreated timber at $3\frac{1}{2}$ lbs. per foot, board measure; and (2) a uniformly distributed live load over floor and sidewalk surface of 100 lbs. per square foot or a concentrated live load consisting of a 15-ton traction engine with weight on the rear axle of 20,000 lbs. and on the front axle of 10,000 lbs., distance between axles 11 ft., distance between the rear wheels 6 ft., and width of the rear wheels 22 in. "Where the floor slab supporting this concentration is relatively thin, as in the deck girder floors, each of the rear wheels is assumed to distribute over an area 4 by 4 ft. Where the slab is 12 in. thick or over the lateral distribution is increased to 6 ft. for each wheel or 12 ft. for the entire rear axle load, and the longitudinal distribution is taken as 5 ft. The culvert loadings are taken the same as the foregoing with the addition that below 1 ft. the wheel load concentration is assumed to distribute through the earth fill in four directions at the rate of $\frac{1}{2}$ horizontal to 1 ver-

tical." The details of the designs of various standard structures, including deck and through girders, are further discussed.

Notes on using kerosene, J. A. KING (*Iowa Engineer*, 15 (1914), No. 2, pp. 56-58).—The author concludes that the best results are obtained today with kerosene as a fuel for internal combustion engines when one uses a thoroughly efficient carburetor in connection with a water spray and on a throttle-governed engine.

Dynamics of a plow, J. KEIR (*Jour. Agr. [New Zeal.]*, 8 (1914), No. 6, pp. 597-606, figs. 12).—The author, in endeavoring to explain the dynamics of a plow, deals with the single furrow lever plow of the New Zealand type having three wheels. He points out in conclusion that a great deal of misapprehension regarding the relative draft of light and heavy plows exists among farmers and plowmen. The draft of plows running on wheels on level land, he states, is not appreciably affected by the dead weight of the plow. "The draft of every plow is almost entirely due to the work done on the furrow, and will vary with the width and depth of furrow, and condition and quality of the land. While a light plow is easier to handle for the man, within reasonable limits and on level land, it makes hardly any difference to the horses."

The strength and design of washers in reference to the bearing on wood, L. R. RODENHISER (*Cornell Civ. Engin.*, 23 (1914), No. 2, pp. 41-45, figs. 6).—Investigations are reported with four different types of structural timber to determine (1) the safe bearing value and ultimate strengths of different woods under different washers, and (2) the economic size of washers in order to make the safe bearing value and ultimate strengths as high as possible and yet keep the weight of the washers down to a minimum. The main conclusions reached are as follows:

For bolts of less than $\frac{1}{2}$ -in. in diameter no reinforcement of the washer is necessary, a flat plate large enough to provide sufficient bearing area being all that is required. For each inch of diameter of the plate there should be $\frac{1}{8}$ in. in height and $\frac{1}{8}$ in. in thickness for the spool, but no spool should be less than $\frac{1}{4}$ in. in height or less than $\frac{1}{8}$ in. in thickness.

Silo construction, P. V. EWING (*Georgia Sta. Bul.* 110 (1914), pp. 165-176, figs. 8).—This section gives general information regarding the size and construction of silos.

Housing in rural districts, E. HOLLOWAY (*Surveyor*, 46 (1914), No. 1182, pp. 330, 331, figs. 4).—The type of rural cottage decided on for the Evesham and Peabworth rural districts of England is described and diagrammatically illustrated. It is one having a large living room and a small scullery on the first floor, and three bedrooms on the second floor, two of which have fireplaces.

The construction of the cottages is as follows: Outside and party walls are of 9-in. brickwork, internal walls on the ground floor $4\frac{1}{2}$ -in. brickwork, and on the second floor 2-in. concrete partition slabs. The roofs are tiled, and have a pitch of 45° . In one case rough-cast has been used for the exterior walls. The floors of the living room are 6-in. square tiles laid on 4-in. cement concrete, and in the scullery and elsewhere on the ground floor granolithic floors have been laid; upstairs, 1-in. best white flooring with matched edges is used, the timber being red deal throughout; the plastering on the ceilings is three-coat work, and on the walls two coats. In every instance casement windows are put in, and ample provision is made both for light and ventilation. The height of all rooms is 8 ft. throughout.

Rural laborers' cottages (*Surveyor*, 46 (1914), No. 1180, pp. 272-277, figs. 21).—A quadruple system of rural housing, each house of which is said to cost not over £152 (\$739.70), is described and diagrammatically illustrated.

Some of the main features of these cottages are as follows: (1) The entrance gives access by a straight stairway direct to the upper rooms, (2) the living room, while directly accessible from the front door, stairs, and scullery, gives the maximum of floor space free of traffic and a fireside away from drafts, (3) all chimneys are on inside walls, (4) all bed spaces are against inner walls while their positions afford the maximum amount of unimpeded floor space, (5) a bath space is available if desired, (6) three sides of each of the upper bedrooms have solid brick walls, and (7) the upper internal walls are natural continuations of those below, there being no partition work.

RURAL ECONOMICS.

The cost of producing Minnesota farm products, 1908-1912, F. W. PECK (*Minnesota Sta. Bul. 145 (1914), pp. 48, figs. 6*).—Continuing previous work (E. S. R., 23, p. 695; 26, p. 474), this report is based upon a study of a number of farms located at Northfield, Marshall, and Halstad, Minn. The report describes the methods of collecting and compiling the statistics, the climatic conditions, average crop yields, and average farm prices, and discusses the various factors used in computing the cost of farm crops and the acre as a basis of comparison.

Among the principal results noted were that the average monthly cost of board per man at Northfield amounted to \$15.43; at Marshall, \$14.17; and at Halstad, \$12.36. The average rate of wages per hour for the eight crop-season months was \$0.149 at Northfield; \$0.139 at Marshall; and \$0.135 at Halstad. The average annual cost of maintaining a farm work horse at Northfield was \$103.41; at Marshall, \$99.67; and at Halstad, \$84.16. The average cost of horse labor per hour worked amounted to 10.1 cts. at Northfield, 9.01 cts. at Marshall, and 8.63 at Halstad. The average annual depreciation of machinery amounted to 6.7 per cent. The annual values consumed per acre (depreciation, labor, cash repairs, and interest) for the commonly used machines were grain binders, 16.8 cts.; grain drills, 7.2 cts.; corn binders, 60.4 cts.; wagons, 19.5 cts.; mowers, 16.7 cts.; and plows, 9.5 cts.

The total cost of producing an acre of spring wheat was reported as \$10.78; oats, \$12.02; barley, \$11.16; flax, \$10.70; potatoes, \$32.18; corn, cut, shocked, and hauled from the field, \$14.75; corn, husked from standing stalks, \$14.52; fodder corn, stacked at the farmstead, \$14.84; clover and timothy, first crop, \$7.51; wild hay, \$7.30. The bulletin also shows the average cost of plowing at different seasons of the year, and other cost data.

The report contains a number of statistical tables showing complete details.

Statistics of cooperation among farmers in Minnesota, 1913, L. D. H. WELD (*Minnesota Sta. Bul. 146 (1914), pp. 22, figs. 8*).—This bulletin indicates that there were 2,013 cooperative organizations in Minnesota on January 1, 1914, and that the annual volume of their business during the previous year was \$60,760,000. Of this number 614 were creameries doing a business of \$21,675,252, 600 telephone companies with a business of \$900,000, and 270 elevators with a business of \$24,000,000. This bulletin describes the most important features found among the cooperative creameries and cheese factories, farmers' elevators, live stock shipping associations, telephone companies, and insurance companies.

The New York State Vegetable Growers' Association (N. Y. State Veg. Growers' Assoc. Rpt. 1913-14, pp. 286, pl. 1, figs. 5).—This report contains a series of addresses relating to the production, distribution, canning, and storing of vegetables.

Report of the public roads and highways commission of Ontario, 1914 (Rpt. Pub. Roads and Highways Com. Ontario, 1914, pp. 277, pls. 16, figs. 16).—This report discusses the development of highways in Ontario, Canada, and its

influence upon the agricultural production and the marketing of agricultural products, and outlines certain factors to be considered in their future development.

Rules and regulations of the Secretary of Agriculture under the United States Cotton Futures Act of August 18, 1914 (*U. S. Dept. Agr., Office Sec. Circ. 46 (1915), pp. 24*).—This circular contains the definitions, rules, and regulations of the Secretary of Agriculture under the United States Cotton Futures Act, which taxes contracts of sale of cotton for future delivery not made in accordance with its provisions. The text of the act is appended.

[Amendment, United States Cotton Futures Act] (*U. S. Dept. Agr., Office Sec. Circ. 46 (1915), Amends. 1, p. 1; 2, p. 1*).—These two amendments relate to the elimination of Waco, Tex., and Fall River, Mass., from among the list of "spot markets."

Government crop reports (*U. S. Dept. Agr., Bur. Crop Estimates Circ. 17, rev. (1915), pp. 27*).—This circular discusses the origin, value, scope, method, and bases of the crop estimates and gives a table showing the scope of work involved in the preparation of the several crop reports by months, and the details involved in making the final estimates.

Statistical atlas of the United States, 1914 (*Bur. of the Census [U. S.], Statis. Atlas U. S., 1914, pp. 99+XII, pls. 503*).—This volume contains maps and diagrams to illustrate the statistical tables of the Thirteenth Census, and includes diagrams and maps relating to rural population, agriculture, manufacturing, and those gainfully employed.

Annual statistics of Chile (*An. Estad. Chile, 10 (1912-13), pp. 221*).—This volume contains statistical data showing the area and production of the principal agricultural products and the number of live stock by provinces.

Report on the agriculture of Saxony for 1913 (*Jahresber. Landw. Königr. Sachs., 1913, pp. VI+343*).—This report gives information concerning agricultural credit, labor, trade, and education, and the inspection of foodstuffs, fertilizers, and seeds, the cultivation of land, animal industries, and live stock sanitation.

AGRICULTURAL EDUCATION.

Proceedings of the Conference on Rural Education, February 10, 1913 (*Proc. Conf. Rural Ed. [Mass.], 1913, pp. 45*).—Among the papers and addresses included in the proceedings of this conference are the following: Rural Education from the Standpoint of the Agricultural College and Teacher, by W. R. Hart; Rural Education from the Standpoint of the Rural Citizen, Taxpayer, and Parent, by E. E. Chapman; The Betterment of Rural Schools, by E. T. Fairchild; Educational Possibilities in the Rural High School, by R. W. Stimson; Educational Possibilities of Improved Social Conditions, by H. N. Loomis; Two Types of Agricultural Education, by D. Snedden; and Needs and Possibilities of Education in Rural Communities, by P. P. Claxton.

Present status of agricultural education in Canada, S. B. MCCREADY (*Internat. Inst. Agr. [Rome], Mo. Bul. Agr. Intel. and Plant Diseases, 5 (1914), No. 5, pp. 571-578*).—The author gives an account of the jurisdiction of the federal and provincial governments, the agricultural instruction act of 1913, and the present organization of agricultural instruction in the various Provinces of the Dominion.

Annual report of the state director of industrial education to the superintendent of public instruction, MANETTE A. MYERS (*Ann. Rpt. State Dir. Indus. Ed. [N. Mex.], 1913, pp. 152, figs. 70*).—This report contains (1) a copy of the act approved June 10, 1912, empowering the New Mexico board of education to prescribe a course in industrial education, including agriculture,

domestic science, and manual training for the public schools, and to appoint a state director of industrial education, and of the 1912 county high school law, providing that manual training and domestic science, agriculture, and commercial science shall be added to the course of county high schools; (2) brief reports on the first and second contest of the boys' and girls' industrial club in 1912-13, and plans for farm crops, poultry, and housekeepers' contests for 1914; and (3) notes on agricultural and domestic science instruction in the various counties of the State.

Vocational schools, A. D. DEAN (*Univ. State N. Y. Bul.* 566 (1914), pp. 76).—The author discusses the operation, spirit, and purpose of the law giving state aid to vocational schools; the principles underlying state aid; the meaning and controlling purposes of vocational education; the rules and regulations of the commissioner of education covering organization, courses of study, and content of instruction; the five types of vocational schools, including the schools of agriculture, mechanic arts, and home making; a description of the progress of agricultural teaching in the Hancock High School as an illustration of the viewpoint of the community toward this work and of difficulties to be overcome; part-time or continuation schools and evening vocational schools in which instruction is given in the trades and in industrial, agricultural, and home economics subjects; the training of teachers for vocational subjects; and the movement for vocational guidance. Typical agricultural, industrial, and drawing programs are given for use of state conferences of teachers, principals, and supervisors engaged in vocational instruction in state-aided schools.

Elementary science courses, ORA M. CARROL (*Nature-Study Rev.*, 10 (1914), No. 7, pp. 253-260).—This is a discussion of the present status of instruction in nature study in normal schools, mainly in the Middle West, and in agricultural colleges and universities.

The teaching of agriculture in the high school, J. G. HICKOX (*Ohio Teacher*, 35 (1914), No. 4, pp. 151, 152).—The author briefly discusses the aim of instruction in agriculture, in what schools it shall be offered, what pupils shall study it, the length and content of the course, laboratory work, and apparatus.

Should normal schools offer a special course for the training of rural school teachers? A. E. MALBY (*Proc. Bd. Princ. State Normal Schools Penn.*, 1913, pp. 4-12).—In this paper the author discusses the necessity of increasing the efficiency of the rural school by bringing it into closer touch with the life of the people, their work, and their interests. In his opinion the rural school under a teacher properly prepared for the work may become a center that will influence every farm and home in the district, hence the normal school should train teachers in agriculture and other rural arts as well as household and manual arts. The work in agriculture should embrace text-book study, reference work, lectures, demonstrations, laboratory experiments, observation of field work, planting and care of school gardens, etc. A certain area of the school ground should be set aside for field work, and poultry yards with necessary equipment might be established, as well as an orchard for demonstration purposes. Two outlines are given of suggested 2-year courses for rural teachers.

Home economics in the agricultural college, JESSIE M. HOOVER (*Jour. Home Econ.*, 4 (1912), No. 2, pp. 150-155).—The author gives an account of what the home economics departments of agricultural colleges are doing to give instruction in home economics by means of regular courses and extension work.

Home economics extension work in Kansas, MARY P. VAN ZILE (*Jour. Home Econ.*, 4 (1912), No. 2, pp. 155-158).—An account is given of the extension work in home economics conducted by the Kansas College, including the women's auxiliary to farmers' institutes, girls' home economics clubs, movable schools, correspondence courses, and state farmers' institutes.

The extension work of the College of Hawaii, V. MACCAUGHEY (*Col. Hawaii Circ.* 3 (1914), pp. 30).—An account is given of the object and organization of the extension work of the College of Hawaii.

Agricultural and household science extension schools and community federations, A. W. NOLAN and R. E. HIERONYMUS (*Agr. Col. Ext. Univ. Ill., Form 27* (1914), pp. 14, figs. 4).—The authors give a description of the organization and work of agricultural and household science extension schools, including typical programs conducted by the College of Agriculture of the University of Illinois, together with suggestive topics and an outline of a constitution for community federations.

Extension work in Minnesota, MARY L. BULL (*Jour. Home Econ.*, 4 (1912), No. 2, pp. 159-161).—The home economics extension work of the University of Minnesota is described.

Social and civic work in country communities, ELLEN B. McDONALD, ROSA M. CHENEY, G. F. COMINGS, and W. E. LARSON (*[Wis. State Supt. Pub. Instr.] Bul.* 18 (1913), pp. 138, figs. 20).—In this bulletin a subcommittee of a committee of 15, appointed by the state superintendent of schools to investigate conditions in the rural schools of Wisconsin, endeavors to show the part the home, the school, and the people must take in social and civic work in country communities. Concrete suggestions are presented for special school and social programs, for the organization for intellectual development of young people who no longer attend school, for gatherings for older people, for the training of teachers for social and civic improvement work, for the organization of permanent clubs for the betterment of home, civic and social, industrial and economic, and educational conditions, and for the federation of these organizations, and an account is given of what Wisconsin is doing for social and civic improvement in rural communities. An article on Farmers' Organizations in the Past, by George Wehrwein, and appendixes on school industrial credit for home industrial work, a suggested constitution for a neighborhood improvement club, and a list of references for teachers and others interested in country life improvement, are included.

Instruction trains (*Agr. Gaz. Canada*, 1 (1914), No. 9, pp. 712-729, figs. 5).—This is a symposium on the methods and experiences of the Provinces of New Brunswick, Quebec, Ontario, Manitoba, Saskatchewan, and Alberta, with "better farming specials."

The Los Angeles nature-study exhibition, C. L. EDWARDS (*Nature-Study Rev.*, 10 (1914), No. 7, pp. 263-270, figs. 5).—This is a description of the second annual nature-study exhibition of the Los Angeles city schools, held June 6.

New course of study (*Neuer Lehrplan, Proskau, Germany: Königl. Lehranst. Obst. u. Gartenbau*, 1914, pp. 27).—This is an outline and description of the new 2-year course of study, including a schedule of hours, of the Royal Institute for Pomological and Horticultural Instruction in Proskau.

Pre-vocational agricultural work in the public schools of Indiana (*Dept. Pub. Instr. [Ind.], Ed. Pubs., Bul.* 8 (1914), pp. 31).—The purpose of this bulletin is to give suggestions on what the schools are expected to do in pre-vocational agricultural work and how the work should be done in 1914-15, by means of type studies based on the state course of study in agriculture. Lists of agricultural books and apparatus for the seventh and eighth and high school grades are included.

[Rural school agriculture] (*Rural School Agr. [Univ. Minn.]*, 2 (1913), Nos. 5, pp. 4, fig. 1; 6, pp. 4, fig. 1; 7, pp. 4, fig. 1; 8, pp. 4, fig. 1; 9, pp. 4, fig. 1; 3 (1913), Nos. 1, pp. 4, fig. 1; 2, pp. 4, fig. 1; 3, pp. 4, fig. 1; *Sup. pp.* 4; 4, pp. 8, figs. 5; 3 (1914), Nos. 5, pp. 8, figs. 7; 6, pp. 8, figs. 5; 7, pp. 8, figs. 2; 8, pp. 8, figs. 2; 4 (1914), Nos. 1, pp. 8, figs. 2; 2, pp. 8, figs. 2).—These circulars treat in

monthly sequence of the study of corn, poultry, nature study, the organization of boys' and girls' clubs, dairy cattle, farmers' clubs and cooperation, farm horses, bread making, sewing, cooking, swine, the acre yield corn contest for 1914, bread making contests, planning a garden, outlines of work for 1914 and 1915, and warm lunches for rural schools.

Elements of forestry, F. F. MOON and N. C. BROWN (*New York: John Wiley & Sons, 1914, pp. XVII+392, figs. 65*).—This general text-book on forestry defines and explains forestry, and discusses its need in the United States and its development here and abroad; the tree, its parts, functions, characteristics, growth, etc.; silvics; silvicultural systems of management; improvement cuttings; artificial regeneration; forest protection and mensuration; lumbering; wood utilizations, technology, and preservation; and forest economics and finance, followed by regional studies. An appendix gives the original and present forest areas in the United States, uses of the principal American species, log rules, etc., and a glossary of terms in forestry and logging.

Helps for domestic science work in seventh and eighth grades, September-October (*Dept. Pub. Instr. [Ind.], Ed. Pubs., Bul. 13 (1914), pp. 25*).—Suggestions are given to village and rural teachers for introducing and carrying on domestic science work, and lessons are outlined for each week in the months of September and October in cooking and the study of foods, sewing and the study of clothing and textiles, and shelter, including projects and problems relating to home and personal hygiene, care of the home, home furnishing, decoration, etc.

Shumway agricultural high schools: Suggestions for laying out and planting the school farm (*Lincoln, Nebr.: Dept. Pub. Instr., 1914, pp. 23, figs. 2*).—Suggestions are given for laying out and planting the 5-acre farms secured by the high schools giving instruction in agriculture under the Shumway Act. The plans are considered under the main headings of fertilizer contests, crop rotations, continuous cropping, a crop museum, a few simple tests with crops, cultural field studies, the orchard, the family garden, and pathological demonstrations.

Some experiments for the garden, J. W. EMERY (*Nature-Study Rev., 10 (1914), No. 7, pp. 281-287*).—According to the author an endeavor is being made in Ontario to meet the chief obstacles to successful school gardening—scarcity of land, neglect during the long summer holidays, lack of broad knowledge on the part of the teacher, and apathy or even active opposition on the part of the trustees and parents—with home gardening, summer courses for teachers, and the sending out of capable young men from the agricultural college to visit every rural section, enlist the sympathies of the parents, and give the teacher a start in the work. The economic side of school gardening is to be emphasized, and in this way it is hoped to find the solution to the problem of rural depopulation. The advantages of the introduction of systematic experimental work as a sort of compromise between the purely cultural and the purely agricultural aims of nature study are enumerated, and experiments outlined which have been found to work out successfully in the neighborhood of the normal school at Stratford, Ontario, and which are deemed possible in the poorest equipped school.

Should school gardens be made to show financial gains? E. S. SELL (*Nature-Study Rev., 10 (1914), No. 7, pp. 273-275*).—The author calls attention to an experiment he is making at the State Normal School at Athens, Ga., to test the theory that gardens should be run in such a manner as to show financial gains when possible. He maintains that it has been demonstrated "that a school garden can be made to better serve the purpose when records are kept that

involve the profits and losses." This method creates an increased interest by students in the garden work and seems to vitalize and make it more of a definite problem.

Nature study and school gardens, H. FINDLAY (*Bul. N. Y. State School Agr. Morrisville [1914], pp. 7*).—This bulletin points out the value of nature study and offers suggestions on making gardens and caring for them.

Suggestions and regulations on the work of corn clubs, J. F. EASTMAN (*Bul. N. Y. State School Agr. Morrisville [1914], pp. 8*).—This bulletin contains reasons why boys and girls of the rural schools should be helped to form clubs or other organizations for studying agriculture and improving the farm practice of their community, a suggested model club constitution, and directions for corn culture.

MISCELLANEOUS.

Twenty-seventh Annual Report of Indiana Station, 1914 (*Indiana Sta. Rpt. 1914, pp. 88, figs. 2*).—This contains the organization list, reports of the director and heads of departments, the experimental features of which are for the most part abstracted elsewhere in this issue, and a financial statement for the state funds for the fiscal year ended September 30, 1914, and for the remaining funds for the fiscal year ended June 30, 1914.

Twenty-seventh Annual Report of Michigan Station, 1914 (*Michigan Sta. Rpt. 1914, pp. 199-559, pl. 1, figs. 107*).—This contains reports of the director and heads of departments on the work of the station during the year, the experimental features of which are for the most part abstracted elsewhere in this issue; a financial statement for the fiscal year ended June 30, 1914; and reprints of Bulletins 272 and 273, Special Bulletins 62-71, Technical Bulletins 18 and 19, and Circulars 21-23, all of which have been previously noted, and of Circular 24, abstracted elsewhere in this issue.

Twenty-fifth Annual Report of New Mexico Station, 1914 (*New Mexico Sta. Rpt. 1914, pp. 85, figs. 6*).—This contains the organization list, a report of the director on the work, publications, and exchanges of the station, including reports of heads of departments, the experimental features of which have been for the most part previously noted or abstracted elsewhere in this issue, and a financial statement for the fiscal year ended June 30, 1914.

Thirty-second Annual Report of New York State Station, 1913 (*New York State Sta. Rpt. 1913, pp. 814, pls. 33, figs. 54*).—This contains the organization list; a financial statement as to the federal funds for the fiscal year ended June 30, 1913, and as to the state funds for the fiscal year ended September 30, 1913; reprints of Bulletins 357-372, Technical Bulletins 27-31, Circulars 20-25, and popular editions of Bulletins 357-359, 361-365, 367, 368 and 369, and 370, all of which have been previously noted; a list of the periodicals received by the station; and meteorological observations noted on page 614 of this issue.

Farmers' Day guide (*Delaware Sta. Circs. 7 (1912), pp. 26; 8 (1913), pp. 26; 9 (1914), pp. 26*).—These circulars, prepared for distribution at the annual Farmers' Day, furnish a key to the experimental plats and live stock in June, 1912, 1913, and 1914, respectively.

Laws applicable to the United States Department of Agriculture, compiled by O. H. GATES (*Washington: U. S. Dept. Agr., Office Solicitor, 1915, 2. Sup., pp. 128*).—This publication represents a revision of that previously noted (E. S. R., 29, p. 899), embracing legislation enacted from August 28, 1912, to October 24, 1914, inclusive.

NOTES.

Alabama College and Station.—Dr. F. L. Thomas has been appointed assistant professor of entomology and assistant entomologist. E. A. Vaughan has succeeded G. W. Ells as field assistant in entomology.

Arkansas University and Station.—The extension service of the college of agriculture has been much developed during the last two years and has brought the institution before the people of the State to a degree not obtained heretofore. Calls for information through correspondence alone have at least doubled in the last six months.

New appointments in the board of trustees include J. K. Mahoney, vice W. H. Askew, deceased; Z. L. Reagan, of Fayetteville, vice Dr. Charles Richardson; and J. K. Browning, of Piggott, vice T. A. Turner.

Hawaiian Sugar Planters' Station.—Paul S. Burgess, assistant professor of soil bacteriology at the University of California and assistant soil bacteriologist in the station, has been appointed chemist, succeeding S. S. Peck, resigned.

Idaho University and Station.—Dr. M. A. Brannon has tendered his resignation as president. E. J. Iddings, vice dean of the college of agriculture and animal husbandman, has been appointed dean of the college of agriculture. J. S. Jones has been appointed director of the station.

The legislature has discontinued appropriations formerly given for extension work, granting only an amount sufficient to meet the Smith-Lever increases.

Iowa College and Station.—The department of chemistry has occupied the new building which replaces that destroyed by fire about two years ago. The new building is a three-story and basement structure, 244 by 162 ft., of brick, stone, and concrete, and cost about \$200,000.

Dr. P. L. Blumenthal has resigned as assistant chemist in the station to take effect June 1.

Maine Station.—Recent appointments effective May 1 include Emery J. Theriault, assistant chemist, and C. Harry White and Walter E. Curtis as scientific aids.

Maryland College.—Miss Katharine A. Pritchard, of Teacher's College, Columbia University, has been appointed state agent in women's demonstration work.

Michigan College.—The new veterinary building for clinical, hospital, and surgical purposes has been completed. The building is of doric design, 174 by 78 ft., and includes a wing for stabling large and small animals, operating rooms, laboratories, and offices. A special feature is the operating room for large animals, 30 by 30 ft., containing a horse operating table controlled by hydraulic power and connected with a recovery stall so that animals may be removed before recovery from anesthetics.

Minnesota University and Station.—As a result of a recent conference concerning substation work, the following general principles have been adopted: All experimental work at substations and experimental farms is to be organized on a project basis, and formulated, approved, and reported in the same manner as are central station projects. Two types of studies may be carried on at substations, (a) regional problems, organized with substation men as leaders

and with scientists from the central station as cooperators or advisors if needed, and (b) state-wide problems, organized with central station men as leaders, and with substation men as cooperators in case it is desired to use the substation as a field laboratory for a portion of the investigation.

E. W. Major has resigned as associate professor of animal nutrition, to take charge of a large dairy farm in southern California. Stephen Anthony has resigned as chemist in animal nutrition to enter the Bureau of Plant Industry of this Department. G. W. Gehrand has been appointed assistant professor of dairy husbandry, effective March 1.

Missouri University and Station.—The 1915 legislature made a total appropriation of \$108,268 for extension work. Of this sum, \$65,268 goes to offset the Smith-Lever federal appropriation, \$35,000 is for county agents, and \$8,000 is for branch short courses. Increased appropriations were also made for the two-year winter course and the soil survey, and an appropriation of \$25,000 for the erection of a new heating plant for the buildings used for teaching purposes on the farm campus. Appropriations were made for the first time for the maintenance of instruction in soils, entomology, and poultry husbandry.

Thomas J. Wornall and Charles E. Yeater were succeeded as members of the board of curators April 1 by John H. Bradley, of Kennett, and H. B. McDaniel, of Springfield, whose terms will expire in 1921. F. W. Faurot has been appointed extension assistant professor of horticulture and has been succeeded as farm advisor for Buchanan County by L. V. Crandall. Other appointments include W. H. Lawrence, horticulturist at the Arizona University and Station, as professor of horticulture, Addie D. Root, of the Kansas College, as extension instructor in home economics and supervisor of girls' club work, and F. E. Longmeyer as farm advisor for Knox County. E. W. Rusk, farm advisor for Audrain County, has resigned.

Nebraska University.—H. F. Williams, of this Department, has been appointed in charge of farm management work in the State in cooperation with this Department. R. R. Stafford and E. L. Godfrey have been appointed assistants.

Nevada Station.—The recent legislature segregated the quarantine and inspection work, the director of the station no longer being chairman of the state quarantine board. The station bacteriologist has been made chief quarantine officer and all expenses of his office are to be defrayed from special state funds. An appropriation of \$2,000 was made for the use of the station farm.

The new laboratory for animal diseases has now been completed and is occupied by the departments of bacteriology and veterinary science.

New Jersey Stations.—*Science* states that Dr. B. H. A. Groth has resigned as plant physiologist to become director of the experiment station of the Republic of Panama, beginning April 15.

Cornell University and Station.—A plan of procedure has recently been formulated by the dean of the college of agriculture with reference to the attitude of the college to cooperative enterprises. The principal purpose sought at the present time, it is announced, will be to ascertain the facts as to the practical workings of cooperative enterprises, this study being deemed essential before the making of specific recommendations. In no case, however, is there to be participation by the institution in the administering of any cooperative enterprise or the handling in any way of its finances or business. Thus in the case of lime, it is believed that the college may advocate its use, give information as to the best formulas, the time of application, and similar points, and, under proper conditions, even suggest that farmers may combine advantageously for cooperative purchases. This stage, however, will under the pres-

ent policy end the functions of the college, and correspondence to obtain the lime or handling of the funds involved must be taken up by others.

The new soils building has now been occupied. It is a large four-story building of buff tapestry brick with white stone facings, equipped with laboratories, classrooms, lecture rooms, etc.

New courses are being offered in vegetable gardening and agricultural journalism. The former course, beginning in the spring of the Sophomore year, includes a summer of practical work with vegetable growers followed by three consecutive terms at the university, much of which is spent in outdoor laboratory work, two terms of advanced work, and graduation in September. Although attendance in the agricultural journalism course is not open to lower classmen and no credit is given, the opening lecture was attended by about 50 students and instructors.

The Farmers' Week attracted a registration of 3,877, which is believed to be the highest yet recorded in this country and an increase of about 50 per cent over 1914.

Charles S. Wilson, professor of pomology and pomologist, has been appointed State Commissioner of Agriculture. Asa C. King, a fruit grower of Trumansburg, was appointed April 1 professor of farm practice. He will engage in certain forms of extension teaching, and his work will further consist of bringing about close relationships between the college and its former students.

Oregon College and Station.—A course on extension work has been provided for the benefit of seniors who wish to specialize in the work of county agents or other forms of extension service. Lectures are to be given by specialists of the various extension sections and demonstrations made by several college and station departments.

The poultry exhibit at the Panama Pacific International Exposition has taken the form of a model poultry plant which shows yard, feeding, house and trap-nest methods of poultry operations, and gives information on the results of selective breeding. An automatic picture device in the upper section of the exhibit furnishes about 50 views of famous layers and other noted fowls, gives feeding rations, and presents other points of interest in connection with poultry husbandry. Mechanical birds and attendants imitate closely the operations of the plant.

Texas Station.—New members of the board of trustees include W. C. Breihan, of Bartlett, J. F. Kubena, of Fayetteville, W. A. Miller, jr., of Amarillo, and A. B. Davidson, of Cuero. L. J. Hart, J. S. Williams, and W. A. Miller, jr., have been appointed as the station committee of the board. W. L. Boyett, supervisor of the feed control service, resigned April 15. James Sullivan has been appointed executive secretary of this service and is to be in charge of the work under the direct supervision of the director of the station.

Vermont University.—The Vermont legislature, just adjourned, made permanent the annual state appropriation of \$8,000 for extension work, which will take care of the increments for Vermont from the national funds for four years to come. It also passed a law requiring towns to assist in the financing of county agent work in counties where these agents are located.

Virginia Truck Station.—F. E. Miller, assistant horticulturist since 1912, has resigned to take up horticultural work with this Department.

Washington College and Station.—W. A. Ritz, of Walla Walla, and E. T. Coman, of Spokane, have been appointed to the board of control. C. A. Magoon has been appointed to the position of pathologist in the station. Miss Florence Ward, of the State Teachers' College of Iowa, has been appointed associate professor in rural education and assistant to the state leader in boys' and girls' club work.

The legislature at its recent session made the necessary appropriations for the duplication of the Smith-Lever fund.

National Academy of Sciences.—The *Proceedings of the National Academy of Sciences* are being published monthly beginning with January, 1915, by an editorial board of which Arthur A. Noyes is chairman and Edwin B. Wilson, managing editor. The Proceedings will constitute the official organ of publication of the Academy, and will contain reports of its business and scientific sessions and of its other activities. It is also intended to serve as a medium for the prompt publication of brief original papers by members of the Academy and other American investigators. Its aim will be to furnish a comprehensive survey of the more important results of the scientific research of this country, supplementing those in special scientific journals. With this end in view the papers will, in general, be much shorter and less detailed than those published in these journals. The Proceedings will aim especially to secure promptness of publication, wide circulation of the results of American research among foreign investigators, and fuller recognition of the advances made in the separate sciences by persons more directly interested in other sciences.

The annual meeting of the Academy was held at Washington, D. C., April 19–21. Among the papers of agricultural interest were the following: Localization of the Hereditary Material in Germ Cells, by Thomas H. Morgan; Stimulation of Growth, by Jacques Loeb; Specific Chemical Aspects of Growth, by Lafayette B. Mendel; Basal Metabolism during the Period of Growth, by Eugene F. DuBois; and The Forests of Porto Rico, by Nathaniel L. Britton.

Agricultural Education in Canada.—The total student enrollment in Canadian agricultural and veterinary schools for the present academic year is reported as 1,962, the largest registrations being those of 565 at the Ontario Agricultural College and 327 at the Manitoba Agricultural College.

In Alberta, the second summer school for teachers was held at the university under the direction of the department of education, and was attended by 165 teachers as compared with 80 in the previous year. The instruction included first- and second-year work in agriculture, nature study, etc., and first-year work in domestic science, household arts, and physical training. A special course for the provincial inspectors of schools was given for the first time.

In British Columbia, the department of agriculture conducted 25 5-day schools for practical instruction in the pruning of tree and bush fruits, apple packing contests were held at 10 fairs, and the pupils of 24 fruit packing schools made exhibits at 18 different fairs. A boys' and girls' crop competition was also held in connection with the farmers' institutes in British Columbia for the first time, upwards of 175 entries being received. Each competitor was required to send a 20-pound exhibit from his plat to the Dominion exhibition held in Victoria and also keep a crop and financial statement. The boy and girl securing the highest total scores received respectively from the department of agriculture a pure-bred heifer calf and a high-grade sewing machine.

The department of agriculture of Manitoba is preparing to enlarge its extension work by introducing a system of field or district specialists in agriculture located in different parts of the Province. Special instruction was given at the Manitoba Agricultural College during the winter for the purpose of fitting these men for their work. It is expected that they will not only provide technical assistance in extending approved methods of cultivation and farm management, but will also assist in improving the marketing facilities, administer the Noxious Weeds Act, and by keeping in close touch with the 14 demonstration farms already established, and others to be established, will be able to advise in regard to the approved methods of land clearing.

The number of boys' and girls' clubs organized in Manitoba has this year increased more than threefold.

A second school of agriculture in New Brunswick, to be known as the Sussex Agricultural Institute, is now being completed at an estimated cost of \$23,500.

The Summer Rural Science School for Teachers held under the supervision of the director of elementary agricultural education at Woodstock, N. B., in 1914, was attended by 68 teachers, 6 inspectors, and 1 normal school instructor. Instruction was given in nature study, horticulture, agriculture, physical nature, farm mechanics, and rural domestic science, supplemented by a series of lectures on insects, field crops, soil improvement, and practical instruction in milk testing.

Since the beginning of the organization of women's institutes in Nova Scotia in July, 1913, 14 institutes have been organized with an average membership of 25, and the first convention of women's institutes has been held with an attendance of 27 delegates. The 1914 legislature appropriated \$5,000 a year for the encouragement of this work.

A feature of the Nova Scotia Rural Science School, held in Truro in July, 1914, was a model school fair for which the teachers provided and arranged the exhibits. The latter included collections of grasses, weeds, and wild flowers, mounted insects, samples of chemical elements necessary to plant growth, a home canning outfit, samples of butter from the agricultural college, dairy apparatus, various fibers, samples of sugars, etc.

The total appropriations in Ontario for agricultural work carried on through the departments of agriculture and of education for the year ended October 31, 1914, amounted to \$1,311,632.75, of which \$395,658 was for the agricultural college, and \$41,200 for institutes.

A new two-story and basement poultry building at the Ontario Agricultural College has been completed, and will be used for administration and instruction purposes.

To bring educational work in closer touch with agriculture, the Province of Prince Edward Island has been divided into 10 districts, in each of which an inspector has been given charge of the educational work. These inspectors will be assisted by the county representatives of the department of agriculture and by the supervisors of women's institutes. A course in nature study has been prepared for the public schools, so amplified as to be of assistance to teachers and in a general program of work for the year.

The three maple sugar making schools in Quebec, located respectively at Beauceville, Ste. Louise, and Minerve, had a total attendance of 17 students and manufactured 1,192 gal. of sirup, 555 lbs. of sugar, and 600 lbs. of sugar wax. The schools were in session 37, 18, and 9 days, respectively.

In the Province of Saskatchewan \$6,500 of the grant under the agricultural instruction act is expended by the department of education for the introduction of agricultural and domestic science courses into high schools and collegiate institutions, and the training of teachers in agriculture at the provincial normal schools. The remainder of the money is about equally divided between the college of agriculture at Saskatoon and the provincial department of agriculture at Regina. The university will spend its grant almost wholly in salaries of instructors in research, teaching, and extension, the appointments made amounting during this year to \$16,400. Instruction was given to 101 students in the regular course of the college of agriculture, to 12 men in the degree course, and to 10 registered in agriculture from other colleges of the university.

The department of education of the Province of Saskatchewan is arranging for the appointment of agricultural instructors at each of the normal schools, a part of whose duties will be the training of teachers in school gardening.

Experimental and permanent plats will be established in connection with each normal school. At the Provincial Normal School, Regina, approximately 10 acres have been set aside for a model rural school garden.

Agricultural Education in the West Indies.—A school of agriculture has been started at Artemisa, Cuba, where pupils from the district schools will receive preparatory instruction in modern scientific farming. The ground, which has been donated to the school for agricultural uses, will be apportioned in small lots to individual students and seeds and fertilizers will be furnished. The department of agriculture proposes to found similar schools at different places throughout the Republic. A tract of 100 acres near Camagüey has recently been purchased.

An agricultural school for boys over 12 years of age has been established at Las Mercedes plantation, near the city of San José, Costa Rica, with the object of training practical farmers. It is under the direction of Prof. Gustavo L. Michaud, an experienced Costa Rican agronomist and educator. The instruction will be theoretical and practical, the latter including the use of agricultural machinery, elementary carpentering, blacksmithing, and brick laying.

The board of agriculture of Quezaltenango, Guatemala, has taken steps toward the establishment of an agricultural school in the vicinity of the city of Quezaltenango.

National Agricultural Institute in Colombia.—The establishment of a National Institute of Agriculture and Veterinary Science, at Bogota, with an experiment farm attached, and an auxiliary school of agriculture and animal husbandry to be located elsewhere, was authorized in December, 1914. Besides the regular 4-year course the institute will offer special normal courses in technical instruction and courses in horticulture, floriculture, arboriculture, and the cultivation and manufacture of raw materials for textiles. One scholarship will be granted by the government to each department of the Republic and 6 scholarships at large will be awarded by the minister of agriculture and commerce.

New Chinese School of Forestry.—A school of forestry has been established in the University of Nanking. Three scholarships in the school have been provided by the forestry fund committee of Shanghai, and the Philippine Bureau of Forestry has offered the services of experts in arranging the course of study, delivering lectures, and otherwise assisting in the work of organization.

New Journals.—*The Annals of Applied Biology* is being issued monthly as the official organ of the Association of Economic Biologists to cover the field in applied biology not now covered by special journals such as those dealing with agricultural science, parasitology, genetics, and medical science. The initial number contains the following articles: Impending Developments in Agricultural Zoology, by F. W. Gamble; The Action of Bordeaux Mixture on Plants, by B. T. P. Barker and C. T. Gimingham; Notes on the Green Spruce Aphis (*Aphis abietina*), by F. V. Theobald; Pollination in Orchards, by F. J. Chittenden; Life History of *Pegomyia hyoscyami*, by A. E. Cameron; Caterpillars Attacking Oaks in Richmond Park, by R. H. Deakin; A Bacterial Disease of Fruit Blossom, by B. T. P. Barker and O. Grove; and On the Preparation of Coccidæ for Microscopical Study, by E. E. Green.

The United States Public Health Service has recently begun a series of popular publications on health and hygiene. These appear at intervals as *Public Health Report Supplements*. In size and manner of presenting information they are similar to the Farmers' Bulletins of this Department, and like them they are for general free distribution in the United States and are also sold by the Superintendent of Documents at a uniform price of five cents per copy. Each number contains a concise and popular discussion by an expert of some

topic pertaining to health or hygiene, and the series should prove of special value and interest to teachers and students.

Internationale Zeitschrift für Physikalisch-Chemische Biologie is being published at Leipsic and Berlin under the editorship of Dr. J. Traube. Among the articles in the initial number may be mentioned that on the History and Development of Physico-chemical Investigations in Biology, by H. J. Hamburger; Further Studies of the Physiology of Anabolism in the Living Plant Cell, by F. Czapek, and The Catalytic Effect of Alkaloids under Various Physical and Chemical Conditions.

Annali de Chimica is being published at Rome, with G. Ampola at the head of a corps of editors and collaborators. The initial number contains an article on Rancidity in Olive Oil and the Oxidation of Oleic Acid in Sunlight, by F. Canzoneri and G. Bianchini.

An *Agricultural Journal* is being issued semiannually by the department of agriculture of Bihar and Orissa and edited by the staff of the Sabour Agricultural College. The initial number contains original articles, weather and crop reports, notes, reviews, notices, etc.

Die Ackerbau auf Ostpreussischen Niederungsmooren is being issued by the Prussian Chamber of Agriculture with Dr. Feldt as editor. The initial number contains a report on the experimental field for moor reclamation at Bledau near Cranz.

Miscellaneous.—At a meeting of the council of the American Association for the Advancement of Science, April 20, action was taken whereby the entrance fee is to be remitted during the present calendar year to new members in Section M (Agriculture) who may join from the Society for the Promotion of Agricultural Science, the American Society of Agronomy, the Society for Horticultural Science, the American Society of Animal Production, and the Official Dairy Instructors' Association.

A scheme for teaching nature study and manual training in the elementary schools of Mauritius, together with the establishment of school gardens and workshops, has been formulated by the department of agriculture in conjunction with the director of public instruction.

The new laboratory building at the Philippine College of Agriculture for the use of the departments of physics, rural engineering, and botany has recently been completed at a cost of about \$16,500.

The Philippine legislature has appropriated \$7,500 for the establishment, equipment, and maintenance of an agricultural school in the Province of Isabela.

The Y. M. C. A. College of Springfield, Mass., has established a special department for country work under the supervision of Walter J. Campbell, formerly Pennsylvania state secretary for country work.

Science states that Dr. Fr. Ostendorf, professor of agriculture in the technical school at Karlsruhe, has been killed in the European war.

EXPERIMENT STATION RECORD.

VOL. XXXII.

JUNE, 1915.

No. 8.

Perhaps no branch of work relating to agriculture is attracting more attention at the present time than rural economics. Questions of the far-reaching influences and relations of systems and practices in farming, of cost of production, of waste and economy, of the farmer's return for his labor and investment, and many others of similar nature are seen to be of fundamental importance, and to call for special expert study. Organization and business management are looked to for the advancement of the industry in much the same way that experiment and research in production have been looked to in the past. Fortunately, provision is being made for such studies in increasing amount, and the place of this effort and its relation to the experiment station is being worked out.

A great deal of our station work has been from the very first economic in purpose and application, although it has not always been thought of as in the field of economics. It relates to a productive industry whose methods are economic, involving the elements of buying and selling, prices of supplies, cost of production, and profit and loss. And the station work has been concerned very directly with the business side of the industry, to make it more productive, more profitable, more safe as a means of livelihood. True, the station work has been thought of as largely directed at the science of production, but in fact it has very often reached over into the economics of production and distribution, especially in its simpler forms.

The subject matter of economics is defined as the study of man's efforts to get a living. The means by which he is enabled to do this through agriculture, the influences which aid and hinder him, and the proper weighing and understanding of these, are in the field of rural economics. Man's success in agriculture has resulted from his knowledge of how to control and direct the forces of nature, and this has been promoted by the accumulation and interpretation of experience, and more recently by the employment of the experimental method, which goes outside the realm of experience in acquiring facts and testing theories and traditions.

It is natural that at the outset simple, practical questions, many of them dealing with the commercial side almost exclusively, should have pressed upon the stations, and that the working out of these

questions should have helped to justify the stations in the communities which they served and won for them an increasingly strong following. Such activity was warranted from its experimental character, and from the fact that the farmers usually could not perform the service for themselves. Again, the stations have found it necessary to determine for their own information and to prove to the farmers the practicability of their findings and suggestions, i. e., their business soundness or wisdom, and also to make clear the economic fallacy of certain current practices and traditions.

Whether or not we think of these activities as being in the field of economics, they border very closely upon it, and they have gone a long way toward laying a foundation for economic studies and for testing the truth of economic generalizations. As soon as we attempt to ascertain the cost of an operation or a practice or a product we are in the economic field, and the study of the factors which influence these considerations are but a step removed from it.

The range and scope of this kind of activity at the stations is very large. It has related to the cost of producing farm crops, meat, wool, and eggs, the marketing of these products, market grades, special requirements or preferences, losses in products during transit or in preparing for the market, and expense of shipment. It has likewise determined the effect of the use of fertilizers and of purchased feeds on the efficiency of production and the attendant cost of the product, and the relative profits from milk, cream, butter, and cheese. It has dealt with the cost of clearing land or otherwise reclaiming it, its relation to the returns, the cost of pumping water for irrigation and the economics of handling water, and the cost of light and power from alcohol, kerosene and gasoline in its relations to man's labor and environment. It has determined the financial returns from spraying against insects and fungus diseases, the relation of age to rate of gain in live stock as an economic factor, financial returns and profits from different systems of farming, the factors which determine profits under various systems, and the effect of various forms of organization upon financial returns.

Not infrequently the experiment stations have followed the results of their experimental work even to the point of developing a new economic system. The dairy work furnishes some notable examples of this. After showing by much study the importance of the fat content of milk as measuring its value for making butter and cheese, and providing a simple method for its determination, the stations worked out the details of systems for paying for milk or adjusting dividends at creameries and cheese factories on the basis of the pounds of fat supplied by each patron, and showed its advantage and justice. The effect upon the economic status of the dairy industry has been revolutionary.

Hundreds of feeding, fertilizer, and spraying experiments have been made for the purpose of learning how to bring greater efficiency into these operations, and how to realize a reasonable profit from money and labor invested. In fact, there is scarcely a farm operation or method which has not been studied from an economic viewpoint by some of the stations. These, and the observations on their application in practice, have constituted a study of man's efforts in earning a living through agriculture.

But these activities are not all that is involved in rural economics, any more than they represent the full field of experiment station work. Although in its final analysis the ultimate object of all our station work may be economic in its application, the directness of the economic aims or bearings varies greatly, and the keeping of the economic factors too conspicuously in mind at all stages has been cited as a criticism of some of the station work. This is the case where the mere determination of the cost or the factors that enter into profit has been the ultimate aim, as for example, in the determination of the rate of gain in weight of an animal, not from the standpoint of the physiology of nutrition or the actual nutritive value or use of a feed, but primarily in relation to economic returns.

While these commercial experiments have been of great help to the farmer and have furnished a broad basis for economic studies, the objection has been made that the results represent little of permanent value, are local in application, and are sometimes little more than a demonstration of results which could practically have been anticipated. It is true that they are subject to much repetition, and are often continued beyond the actual experimental stage. Some men have seemed content to stop their work at the point where the theoretical interest begins.

The narrower range of application of these experiments may be in part due to the data not having been subjected to interpretation from an economist's point of view. The work has been carried on by agronomists, animal husbandmen, horticulturists, dairymen, and has been interpreted by them in the light of their own view and surroundings. Already there is some evidence that the attempt to make broader interpretations or generalizations from the summarized data of many experiments needs the assistance of the statistician or some one trained in the handling of data. The method of the economist differs from that of the experimenter, both in the handling of the data and the use he makes of them. There is a place for both, and some danger in attempting to combine the two functions.

It is undoubtedly true, for example, that experimental work has suffered from a confusion of economic and scientific ends. This is shown in some of our feeding trials. In the attempt to determine the effect of a certain feed upon the dairy cow the purely economic

aspects have been allowed to enter prominently into the experiment at an early stage, and sometimes well nigh to the exclusion of the study of the physiological effect. Many of our fertilizer experiments also have stopped with the immediate economic result and have failed to achieve a broader scientific value. The two ends should not be confused, or one will be likely to suffer.

In a physiological study of plant or animal it would be well if the experimenter could forget the economic side for the time being, and devote himself to determining by every means at his command the actual effect of the material or treatment upon the plant or animal, or its relation to function. The material fed to the cow may cost ten dollars a pound because it is a synthesized or artificially separated compound, and the result may be absolutely devoid of economic value. But if the study helps to a clear knowledge of the action or value of the compound as a prominent constituent of a feeding stuff, the result will ultimately be turned to economic advantage.

The recognized function of an experiment station is to acquire accurate information by means of experiment and research. For most of its workers its object is primarily the study of the theory of production and the relation of the facts developed to practical methods. It is scientific rather than speculative, and deals with facts and principles developed by investigation through science. The work of the station is on a constructive basis. While it will take account of the experience of practical men, its results will be the product of its own or similar investigations. These may be compared with results obtained by farmers, and brought into harmony with them, or used to explain deficiencies in ordinary farm practice, but they will usually be original in the sense of resting upon experimental work rather than statistics of practice.

The work of the stations is essentially experimental, dealing with conditions not only as they exist but as they are modified experimentally to determine the value of separate factors or conditions. It differs, therefore, from studies in rural economics, which deal primarily with conditions as they are found to exist and are statistical rather than experimental. The rural economist gathers data as to farm statistics, or tabulates the experience of individual farmers, or conducts economic surveys, but he also makes use of such experimental data as are available. Although he does not himself conduct experiments under modified conditions, he takes account of the results of experiments in agriculture and uses these as well as the results of general experience in developing his generalizations or theories. The experimental work of the stations may therefore be considered as contributory, and in fact it has furnished a formidable array of data for economic consideration.

Definite provision for investigation and propaganda work in rural economics is gradually being made at the agricultural colleges and experiment stations. This is manifestly broader in its scope and treatment and more systematic than most of the economic work of the stations in the past. The subject is a special field in itself, with its methods and principles, and with relationships and contacts which extend into different fields from those of the student primarily concerned with the science of production.

The advantage of the rural economist is the special point of view he contributes, enabling him to trace far-reaching relationships and consequences applying to the industry which would be overlooked by investigators in a narrower field of study; and beyond this he supplements the investigations of these specialists in lines not otherwise covered. For, just as the economics of agriculture includes far more than the tabulation of data of production, cost, prices, and distribution, so investigation in rural economics goes beyond the question of cost and profits as brought out in experiment, and traces tendencies and consequences of systems or conditions upon the industry and the people associated with it. It views recorded facts and the data it accumulates not merely for themselves or with reference to their direct application, but in the aggregate and in relation to their causes and their effects considered in a broad and comprehensive sense.

The complexity of modern life is as apparent in farm operations as in other fields of endeavor. Whether or not it is advisable for the Massachusetts farmer to raise wheat does not depend alone on his ability to produce good yields and to sell his wheat for more than the cost of production. It depends on a great variety of considerations relating to the economic conditions of wheat raising, competition with western and southern States, Canada, Russia, Argentina, and Australia, the probable cost of production as compared with that in competing States and countries, transportation facilities, the use of machinery and the local labor conditions, quality of the wheat as compared with wheat from other localities, adaptability of the crop to a suitable rotation system, and especially the suitability of the locality to other crops and the returns from them. A scientific study of the economics of any farm operation or system of farm management must give due consideration to these points individually, as well as to their bearing on one another and their place in a general economic system.

There is a recognized need for definite economic studies of limited range. And just here the question arises as to where such studies belong and where they can best be provided for. Some of the colleges and stations are conducting studies of systems of cropping, farm management, cost of operating farm machinery, the economy

of human labor and team labor, systems of cost accounting, the efficiency of cooperative associations and other organizations, conducting agricultural surveys, etc. They are attempting to apply scientific management and the principles of economics in agriculture, not as incidental to other investigations but as a primary undertaking. This work is becoming systematized and methods for it are being developed rapidly.

As a basis for the formulation of an economic system it is often necessary to ascertain the conditions and farm practices that actually exist, the cost of production under varying farm conditions and methods, and the business aspects of various systems of farming. But such studies as an end in themselves have not commonly been considered within the special field of the experiment station. In connection with their experiments the stations have often found it necessary to take account of actual farm practice, good and bad, and to subject it to the test of experiment. But the gathering of farm data has been done as an incident to its studies and not as an end in itself.

The idea of the experiment station is opposed to the latter historically. Until the experimental method was applied, science and practice, in agriculture and elsewhere, advanced by a study of things as they were found in nature or had developed through the changes of time and also upon the basis of experience. The experiment station movement carried the idea of going outside of human experience in developing understanding and testing methods of practice, by introducing science into agriculture through the experimental method.

In this sense the station work has been thought of as experimental inquiry, rather than economic inquiry; and because the latter employed the statistical method quite largely it has been looked upon as in a somewhat different field of activity. Some forms of it, like farm management studies, have been a combination of investigation and of teaching or demonstration from the farmers' own experience. It is fully recognized that economic inquiry, like experimental inquiry, may result in new knowledge, often representing a general truth, if it does not stop at the compilation stage. And, on the other hand, it is quite possible for the stations to conduct studies which will supplement these statistical surveys, and will furnish a basis for the formulation of broader truths or generalizations.

Many of the strictly economic studies in the past have dealt with very broad questions, difficult to formulate with exactness, and difficult to support entirely on reliable data. The matter of securing the data has often been a large undertaking, and its collection has absorbed much of the economist's time. The lack of reliable and com-

plete data is one of the greatest handicaps in economic studies. It has been one of the obstacles to conducting them through the experiment station.

The economist ought to have at his command sufficient data, gathered in an accurate and dependable manner. Some of these data are difficult to obtain. Their collection requires much time and the expenditure of large sums of money. Manifestly the experiment station can not be expected to furnish these data in any comprehensive way, for its appropriations, if available for that purpose, would not go far. Only in a limited way is it an experiment station function. There would seem to be need of special provision for gathering such information. This might be done by the States through their departments of agriculture or other agencies, on the advice of competent economists. The stations could often add to such statistics the results obtained by exact experimental inquiries, and in many cases such experimental inquiries are very desirable.

In the question, for example, of the cost of milk production, which is a controverted one in several States, it is not sufficient to collect data from farmers and from milk dealers and other interested parties, based on inexact records and possibly on practice which can not be fully commended. There is need of exact and reliable information, free from bias and distinguishing between what is and what should be under efficient practice. Any economic inquiry into this question of a fair farm price for milk will naturally take account of the large body of reliable information concerning the cost of producing milk which the stations have acquired; and if a station has made a careful study of the subject in all its details, in which not only the stable side but the various features connected with transportation and handling have been taken into account, its results should be of marked economic importance.

The data which serve as the foundation for rural economics vary in relative importance from year to year. Fluctuations in the labor supply, in the extent of competition, in the prevalence of pests and diseases, in the general demand for the product in question, and in the area planted to a given crop, all modify the economic status of crops and systems of farming. Loss of old markets, access to new markets and the opening and settlement of new lands also have an effect upon the market value of farm products. The establishment of new railroad or steamship lines may render a new market accessible to a given farming district, but may also open the same market to more favored competitors, thereby making unprofitable the growing of certain crops. Hence the process of gathering data must be continuous, and must be systematized so as to make the figures comparable.

To become appropriate lines of work for an experiment station, economic studies need to be clearly conceived and definitely drawn. As pointed out, the station's work is not in any primary sense the gathering of statistics or the making of surveys or the tabulation of individual experience. Economic studies, like the projects for investigation in the principles of production, require careful planning in advance, and should imply a rigid testing of the reliability of available data. They should contemplate an analysis and interpretation of the broader underlying meaning of the results, for otherwise the facts will remain isolated, disconnected facts of little dynamic force or value in a broad way. There are certain classes of statistics which are relative rather than absolute and which can be correlated with sets of conditions or systems of practice. These enable the economist to get at fairly definite and conclusive underlying principles.

There is no lack of opportunity for studies of this kind. Such questions, for example, turn on the economizing of land, labor, and capital. It has been said that in the elimination of labor waste lies greater opportunities for the constructive economist than in any other direction. A broad group of questions relating to intensive farming and its economy are suggested by the advice now being freely and widely given for more intensive cultivation, smaller farms, greater specialization, etc. How far this is sound under present conditions, and how far it is to be regarded as the solution of our agricultural problems and of cheaper foodstuffs, we must look quite largely to the economist to tell us. It would be interesting to know also how far the introduction of more scientific and rational methods might possibly modify the law of diminishing returns.

In the future work of the stations in the field of rural economics the difference must be distinguished between the formulation of economic facts and principles of agriculture on the one hand, and the active effort to put these into effective practice through the organization of farmers and otherwise. The one is investigation, the other is teaching or propaganda work. The development of effective means and plans for organization seems to occupy a middle ground. Larger attention to the economic features of farming will involve both station and extension activities, and the distinction between these will need to be clearly maintained.

The time has come when it is well for the experiment stations seriously to consider how widely the fundamental purposes and traditions of station work, taken in connection with the funds available and the need for investigation in agricultural production, will permit them to engage to any large extent in economic studies; and for each State to consider how it may best provide for gathering miscellaneous farm and other agricultural statistics which the economist will require for the formulation of the principles of rural economy.

RECENT WORK IN AGRICULTURAL SCIENCE.

AGRICULTURAL CHEMISTRY—AGROTECHNY.

The total fatty acids and other ether-soluble constituents of feeding stuffs, J. B. RATHER (*Texas Sta. Bul.* 169 (1914), pp. 5-30; *abs. in Jour. Indus. and Engin. Chem.*, 7 (1915), No. 1, pp. 34, 35).—In some previous publications (E. S. R., 28, p. 108; 31, p. 71) "it has been shown that the unsaponifiable matter in the ether extract of hays and fodders averages about 58 per cent of the total extract, and is of much lower digestibility than the saponifiable matter. It has also been shown that chloroform extracts comparatively large percentages of material from hays and fodders previously extracted with ether, and that this extract contains fatty acids." A method was described by means of which it was possible to separate the constituents of the extract into three fractions: Unsaponified (largely wax alcohols), uncolored saponified (fatty acids), and colored saponified (chlorophyll and related compounds), and designated the digestion method.

An improved method (precipitation method) for the determination of total fatty acids and nonsaponifiable matter of the ether extract has now been devised. "This method for the separation of the constituents of ether extracts into three fractions is essentially as follows: Saponify the ether extract, acidify and dissolve in ether, precipitate the fatty acids from ethereal solution with aqueous alkali, and remove by washing with water. Acidify the soap with acetic acid and shake with petroleum ether to dissolve fatty acids and then with ethyl ether to dissolve the residue."

Another new method is proposed which utilizes an alcoholic soda solution for dissolving the fats. "Alcoholic soda probably dissolves less nonfats than aqueous soda; soap solutions in alcohol are more easily manipulated; and fats are soluble in alcohol alone. The advantages of alcohol over water thus appear to be considerable. The use of aqueous alkali would not prevent the contamination of the soap with unsaponified material, because the latter is both soluble in soap solutions and emulsifiable with aqueous alkali.

"Ether extracts of the concentrates contained saponifiable material which does not appear to be fatty acids, averaging about 8 per cent, and unsaponifiable matter averaging about 6 per cent, a total of approximately 14 per cent of nonfats in the ether extract of concentrates. Ether extracts of hays and excrements from them contain saponified material which does not appear to be fatty acids, averaging about 15 per cent of the ether extract. Together with the unsaponifiable matter, they made a total of approximately 68 per cent of nonfats in the ether extract of roughages. Molecular weight determinations and other evidence indicate that the ether soluble, petroleum-ether soluble acids in the alcoholic soda extracts of feeding stuffs are probably fatty acids.

"The digestibility of the various ether-soluble fractions was determined in six hays with sheep. The fatty acids are digested on an average of 60.5 per cent in the ether extract; the fatty acids in the alcoholic soda extract were digested 33.7 per cent. The digestibility of the fatty acids extracted by alco-

holic soda but not by ether had an average digestibility of 11.2 per cent. The digestibility in four cases was zero. The saponified residue of the ether extract was digested, on an average, 45.1 per cent, and in the alcoholic soda extract 25.8 per cent. The nitrogen-free extract of feeding stuffs contains considerable material soluble in ether, which can be extracted by alcoholic soda. This ether-soluble matter consists of unsaponifiable matter, fatty acids, and, principally, of nonfat organic acids, in the case of hays and excrements from them. It made up from 2.72 to 12.39 per cent of the nitrogen-free extract of those samples, and averaged 5.97 per cent. In the concentrates it made up from zero to 3.84 per cent of the nitrogen-free extract, and averaged 1.49 per cent of the nitrogen-free extract."

Chemical changes during silage formation, R. E. NEIDIG (*Iowa Sta. Research Bul.* 16 (1914), pp. 3-22; *Jour. Amer. Chem. Soc.*, 36 (1914), No. 11, pp. 2401-2413).—Continuing previous work (E. S. R., 29, p. 712), an examination of the contents of three types of silo, viz, wooden stave, hollow clay tile, and concrete, showed the following changes during the actual period of silage formation:

"Nonreducing sugar was rapidly changed to reducing sugar, and the latter then decreased in amount but did not disappear completely. The amount of volatile acids increased daily. In the concrete silo, as already demonstrated for the hollow tile and wooden stave silos, the racemic lactic acid produced showed a daily increase. Alcohol was formed in small amounts in each silo. Carbon dioxide developed very rapidly after filling the silo. Free oxygen disappeared entirely after the second or third day. The maximum temperature observed in any of the three silos was 91° F.

"Within the limits of this investigation, no differences were noted which might be attributed to differences in the material of which the silos were constructed."

Synthetic processes taking place during the autolysis of yeast, N. IWANOFF (*Biochem. Ztschr.*, 63 (1914), No. 4-6, pp. 359-368, fig. 1; *abs. in Jour. Chem. Soc. [London]*, 106 (1914), No. 621, I, p. 911).—In this work the proteins were precipitated by cupric hydroxid, the proteoses by lead acetate, and the diamino acids by phosphotungstic acid. The nitrogen in the various fractions was estimated during the progress of autolysis. It was noted that the addition of potassium hydrogen phosphate to the mixture increased the protein fraction.

Enzymes of *Aspergillus oryzae* and the application of its amylolytic enzyme to the fermentation industry, J. TAKAMINE (*Jour. Indus. and Engin. Chem.*, 6 (1914), No. 10, pp. 824-828).—A review of the literature and some of the author's work on the use of *A. oryzae* in the preparation of taka-koji. Taka-koji is suggested for use instead of malt for saccharifying cereals employed for the preparation of alcohol, etc.

Studies on enzyme action.—XI, Some experiments with castor bean urease, K. G. FALK and K. SUGIURA (*Jour. Amer. Chem. Soc.*, 36 (1914), No. 10, pp. 2166-2170).—Castor bean urease (E. S. R., 30, p. 409) was found to hydrolyze much less urea than did similar soy bean preparations under comparable conditions, but the action of acids, bases, and salts on the hydrolysis of urea by castor bean urease was found to be similar to that observed by others with soy bean urease. For previous work see a note by Zemplén (E. S. R., 27, p. 633) and elsewhere.^a

A comparison of methods for the determination of the proteolytic activity of pancreas preparations, J. H. LONG and A. W. BARTON (*Jour. Amer. Chem. Soc.*, 36 (1914), No. 10, pp. 2151-2166).—"In this paper a comparison of the

^a Hoppe-Seyler's Ztschr. Physiol. Chem., 75 (1911), No. 3, pp. 169-196.

proteolytic value of six pancreas preparations has been made by four distinct methods, the metacasein reaction, a modification of the Fuld-Gross reaction, the formaldehyde titration of amino acids liberated in digestion, and the fibrin digestion. It was hoped to find such relations as would permit the translation of activity as expressed on a given standard in terms of another.

"By the four methods the activities of the six preparations are arranged in the same general order, that is, the strongest ferment by the first method is found to be the strongest by the others. For the weakest preparations the order is about the same. But the relative rank, quantitatively, of the different ferments is very different as measured by the different methods. While the strongest ferment by the metacasein reaction appears to be about 12 times the strength of the weakest, and about 10 times as strong by the digestion of fibrin, by the other tests the relation is as 2 or 3:1. Even greater irregularities appear in comparing some of the other ferments.

"It is not possible at the present time to translate the proteolytic value of a tryptic ferment from the terms of one standard to the terms of another with the products as at present furnished by chemical or pharmaceutical dealers, because these preparations are made by very different processes of extraction, concentration, or activation, which leave, probably, mixtures of ferments in widely different proportions in the finished products, and unknown amounts of inorganic salts. There is evidence to suggest that the products sold as trypsins or pancreatins contain at least two different enzymes reacting in different ways with proteins. The effects observed in any case are mixed effects depending on the proportions in which the enzymes are present. These enzymes possess different degrees of thermostability.

"The desirability of a more rational definition of trypsin is pointed out. The definition should include a statement of the essential points of manufacture and should be authorized by some responsible body, such as a pharmacopoeial revision committee. Since what is called trypsin is prepared for the use of medical men, these users are entitled to the fullest knowledge concerning the composition and properties of the product. There is no excuse for secrecy here, and products should be made to conform to interchangeable standards."

Inversion of saccharose by asparaginic acid, L. RADLBERGER and W. SIEGMUND (*Österr. Ungar. Ztschr. Zuckerindus. u. Landw.*, 43 (1914), No. 1, pp. 29-43, figs. 2; *abs. in Chem. Ztg.*, 38 (1914), No. 35, *Repert.*, p. 162).—Tests made with 10 gm. of sucrose and 0.1 gm. of asparaginic acid in 100 cc. of aqueous solution at 30 to 80° C. for 0 to 240 minutes resulted in showing that inversion occurs. The inverting power rises with an increase in temperature.

The preparation of raffinose, C. S. HUDSON and T. S. HARDING (*Jour. Amer. Chem. Soc.*, 36 (1914), No. 10, pp. 2110-2114).—A description of a procedure by which raffinose can be prepared from various samples of commercial cottonseed meal with a yield of 2.5 to 4 per cent. Several advantages are claimed over the method previously noted (*E. S. R.*, 24, p. 608).

Blood pigment and chlorophyll.—Their close relation points to a common origin of animal and plant life, O. DAMM (*Sci. Amer. Sup.*, 77 (1914), No. 1999, p. 269, figs. 3).—This discusses the points which the constituents of hemoglobin and chlorophyll possess in common in the light of new researches (Willstätter, Marchlewski, etc.).

The constituents of Clematis vitalba, F. TUTIN and H. W. B. CLEWER (*Jour. Chem. Soc. [London]*, 105 (1914), No. 621, pp. 1845-1858).—A study of the climbing plant known popularly as "traveler's joy."

"The material employed consisted of the flowering branches of *C. vitalba*, which had been specially collected for the purpose. Preliminary tests showed

the absence of any alkaloid and that only a trace of volatile material was present. An alcoholic extract of the dried and ground material yielded, in addition to much chlorophyll and resin, the following definite compounds: (1) 3:4 dihydroxycinnamic acid; (2) caulosapogenin, $C_{42}H_{86}O_6$, identical with the substance recently isolated by Power and Salway from *Caulophyllum thalictroides* (some of the derivatives of caulosapogenin yielded on analysis apparently anomalous results, which can not at present be explained); (3) a saponin, $C_{54}H_{96}O_{16}$, which proved to be a glucosid of caulosapogenin; (4) dextrose; (5) myricyl and ceryl alcohols; (6) hentriacontane, $C_{31}H_{64}$; (7) a phytosterol, which appeared to consist of a mixture of sitosterol, $C_{27}H_{48}O$, and stigmasterol, $C_{30}H_{50}O$; (8) a phytosterolin, which apparently consisted essentially of stigmasterol glucosid; (9) melissic, cerotic, and palmitic acids, together with a mixture of unsaturated acids consisting largely of linoleic acid and an acid, $C_{22}H_{44}O_2$ (melting point, 69.5°), apparently isomeric with behenic acid.

"The statements regarding the irritant properties of *C. vitalba* can not be confirmed."

Organic phosphoric acid of rice, ALICE R. THOMPSON (*U. S. Dept. Agr., Jour. Agr. Research*, 3 (1915), No. 5, pp. 425-430).—In some previous work on the determination of phosphoric acid in the grain of rice (E. S. R., 29, p. 231), it was found that when oxidizing with a mixture of hydrochloric and nitric acid a colorless solution was soon obtained, but when the solution was evaporated to dryness a charred mass remained behind. Determination of phosphoric acid in the grain (not boiled to dryness) showed only one-third of the total phosphoric acid found by the Neumann method. The foliage of the rice plant, on the other hand, showed no such differences with the two methods. "It was thought that the reason for this resistance to the action of aqua regia is probably the fact that phosphoric acid occurs in the rice grain as phytin and is therefore not completely hydrolyzed. It was decided, therefore, to give some study to the organic phosphoric acid of rice."

In attempting to obtain the pure tribarium salt of phytic acid from rice by the methods of Anderson (E. S. R., 27, p. 712; 28, p. 17; 31, p. 707), it was found that the substance was partially hydrolyzed very easily and difficulty was experienced in eliminating impurities such as other phosphoric acid esters of inosit. In the work special attention was paid to the methods for the determination of the barium and phosphoric acid in the salt. "The total phosphorus was determined in samples of rice bran and unpolished and polished rice. The following determinations were duplicated to within 0.02 per cent: Phosphorus in rice bran, 2.291 per cent; in unpolished rice, 0.321 per cent; in polished rice, 0.14 per cent."

Phytin was determined in rice bran by extraction with a 0.02 per cent hydrochloric acid solution and precipitating with alcohol. The amount found was 8.22 per cent. Attempts to obtain it in polished rice were unsuccessful.

Two preparations of barium phytate, one from rice bran and the other from unpolished rice, were made by Anderson's procedure. "The salts thus obtained were practically free from chlorids and inorganic phosphates. Nitrogen was also absent. All the material of the first preparation was used in making repeated determinations of barium, phosphorus, carbon, and hydrogen, but the phytin obtained from the bran was analyzed also for ash constituents other than barium. In 0.6 gm. of this material an unweighable trace of calcium was found, but no iron, manganese, magnesium, or potash. The residue on precipitating out the barium and igniting the phytic acid thus left amounted to a few milligrams and was composed mostly of unvolatilized phosphoric acid. No nitrogen was found in the salt." The salts contained less phosphoric acid and barium than found by Anderson for tribarium-inosit-hexaphosphoric-acid.

It could not be stated with certainty whether the barium phytate obtained was composed of a single salt of inosit.

"Inosit was prepared from the barium phytate of rice bran by heating in sealed tubes to 150° C. about 2 gm. of the salt with 20 cc. of 30 per cent sulphuric acid for five hours. The sulphuric acid was precipitated with barium hydroxid, the excess of barium removed by carbon dioxid, and the filtrate evaporated to dryness. The residue was extracted with hot water and filtered. The inosit was precipitated by ether and alcohol and recrystallized three times in minute needles. These gave the Scherer reaction and melted at 223° uncorrected."

Presence of a glucosid in the sunflower, A. ZANOTTI (*Bol. Chim. Farm.*, 53 (1914), pp. 4, 5; *abs. in Jour. Chem. Soc. [London]*, 106 (1914), No. 621, I, pp. 913, 914).—In the leaves of the sunflower a glucosid of the probable formula $C_{11}H_{19}O_4N_2$ was found. The substance, however, has not yet been completely purified.

The chemistry of tobacco resins, J. VON DEGRAZIA (*Fachl. Mitt. Österr. Tabakregie*, 13 (1913), No. 3, pp. 109–117; *abs. in Chem. Ztg.*, 38 (1914), No. 41, *Repert.*, p. 189).—Haid, in the sixties of the past century, noted three different constituents of tobacco resin, viz, kentuckylinic acid, $C_{23}H_{40}O_5$, kentuckynoleic acid, $C_{22}H_{38}O_6$, and kentuckynic acid, $C_{22}H_{40}O_7$, as well as a neutral resin, $C_{12}H_{20}O_2$, and an essential oil. Some of these results were verified by the author. A method for purifying the resinous constituents is given. The following were noted: α -Tobaccenic acid (probably identical with Haid's kentuckynic acid), a brittle, dark brown, odorless mass; β -tobaccenic acid, a dark green brittle mass (probably contaminated with chlorophyll); γ -tobaccenic acid, a thick, brownish fluid substance; tobacco-resinol, the resin alcohol of tobacco, which in a pure state consists of colorless needles having the composition $(C_6H_{10}O)_x$; and tobacco-resene, a reddish, thick, brown fluid mass having an odor like honey and an empirical formula of $C_{33}H_{64}O_2$.

The essential oil which was found had a yellow color, a very pleasant odor, and a refractive index of 1.4882. No conclusions were drawn as to whether the essential oil is the carrier of the tobacco aroma.

The arsenates of lead, H. V. TARTAR and R. H. ROBINSON (*Jour. Amer. Chem. Soc.*, 36 (1914), No. 9, pp. 1843–1853).—"Taken as a whole, the literature indicates that there are at least two common lead arsenates, lead hydrogen arsenate and lead orthoarsenate; that these two compounds are the main components present in ordinary commercial lead arsenate; that lead pyroarsenate may possibly be present in the commercial salts; and that there is very little accurate knowledge of the preparation and the chemical and physical properties of the pure compounds. See also a note by Holland and Reed [*E. S. R.*, 28, p. 308]."

In this work a reliable method has been devised for the preparation of pure lead hydrogen arsenate, but all attempts to prepare pure lead orthoarsenate were unsuccessful. "Fairly pure lead hydrogen arsenate is prepared by use of the reaction between lead nitrate and disodium hydrogen arsenate."

Lead pyroarsenate was prepared and a new basic lead arsenate of apparently constant composition was obtained. "The specific gravity of lead hydrogen arsenate and basic lead arsenate have been determined. The difficulties attending the accurate determination of the solubility of the compounds prepared have been pointed out. The tests made, however, show these substances to be relatively insoluble."

According to the authors there is at the present time no method for estimating the amount of lead hydrogen arsenate in commercial arsenate of lead. It was found that "since the basic arsenate may be considered as insoluble from

the usual analytical standpoint, lead hydrogen arsenate in mixtures with the basic arsenate can be easily determined by the following described method:

"Take a convenient amount of the finely powdered sample (3 to 10 gm.), depending upon the amount of the acid salt present, which has been dried at 100°, and add 200 cc. of a 5 per cent solution of carbon dioxid-free ammonium hydroxid. Allow to digest with occasional shaking for a few hours at room temperature, when the reaction should be complete. The supernatant liquid is then filtered by suction from the insoluble basic salt by using a Buchner funnel prepared with a pad made of two sheets of filter paper with a layer of asbestos between. The upper paper should be a hardened filter. The filter is finally washed thoroughly with recently boiled distilled water until free from soluble salts. The final washings may be tested with lead nitrate solution to ascertain the completeness of the removal of the ammonium arsenate. The filtrate should be perfectly clear. In case there is difficulty in obtaining a clear solution it may be overcome by refiltering through a Gooch crucible having a thin layer of carbon black on an asbestos pad. The final filtrate obtained is made up to convenient volume and an aliquot taken for the determination of arsenic. After free ammonium hydroxid is removed by boiling, the arsenic is determined by the modified Gooch and Browning method. The amount of arsenic in the total filtrate calculated as As_2O_5 and then multiplied by the factor 7.6034 gives the amount of lead hydrogen arsenate present in the original mixture.

"This method has been tried out on a number of mixtures of known composition and in each case has given good results."

"The results show that the precipitates obtained from the reactions of lead acetate and lead nitrate with disodium hydrogen arsenate under certain conditions are mixtures of lead hydrogen arsenate and the basic lead arsenate."

The estimation of sulphuric acid, sulphates, potassium, and calcium, L. LEDOUX (*Abs. in Bul. Soc. Chim. Belg.*, 28 (1914), No. 2, pp. 51, 52; *Chem. Ztg.*, 38 (1914), No. 54, p. 575).—To 200 cc. of solution 10 cc. of concentrated hydrochloric acid and 50 cc. of a 2 per cent barium chlorid solution are added for the precipitation of the sulphates. The mixture is then shaken for one hour in the cold. Calcium is precipitated with ammonium oxalate, and the potassium is obtained as potassium platinic chlorid and reduced when warm with magnesium.

Studies upon a new method for the quantitative estimation of potassium, F. MARSHALL (*Chem. Ztg.*, 38 (1914), Nos. 55, pp. 585–587; 58, pp. 615, 616).—Of the known methods for determining potassium quantitatively the platinic chlorid and perchloric acid methods are the most frequently used, although both methods, but more especially the first named, have objectionable features.

In the method proposed an aliquot of the solution containing the alkalis only as chlorids and representing about 0.05 gm. of potassium oxid is placed in a beaker and evaporated to dryness on the water bath. The residue is dissolved in as little water as possible (2 to 3 drops is usually sufficient), and an excess (20 cc.) of a 2 per cent alcoholic solution of tartaric acid (one which has stood for several days over solid potassium bitartrate and has been repeatedly shaken and then filtered) is added. After the precipitation is complete, from 10 to 20 cc. of a bitartrate-containing alcohol (96 per cent) is added and boiled for 10 minutes on the water bath. The beaker is allowed to stand covered for 24 hours, shaking, however, at intervals, and then the contents are transferred to a weighed Gooch crucible. The precipitate is washed with potassium bitartrate-alcohol and finally with pure 96 per cent alcohol, dried at 80° C., and weighed as potassium bitartrate. By dividing the weight obtained by 3.992 the corresponding amount of potassium oxid is found.

See also previous notes (E. S. R., 32, pp. 608, 609).

The microscopy of cereals and its application in the brewing industry, A. L. WINTON (*Amer. Brewer*, 47 (1914), Nos. 5, pp. 234-236, figs. 5; 6, pp. 290-292, figs. 11; 7, pp. 341-343, figs. 9; 8, pp. 402, 403, figs. 6).—A lecture on the subject, which is illustrated with photomicrographs of the histological structure of various cereals and starches.

The examination of Belgian varieties of honey, R. LEDENT (*Bul. Soc. Chim. Belg.*, 28 (1914), No. 3, pp. 73-77; *abs. in Chem. Ztg.*, 38 (1914), No. 54, p. 575).—The author finds that the methods of Fiehe and Jaegerschmidt will detect invert sugar. The degree of adulteration can be estimated from the amount of protein, determined by Lund's method.

A new method for determining the total solids in wine, V. NJEGOVAN (*Ztschr. Analyt. Chem.*, 53 (1914), No. 3, pp. 160-165; *abs. in Chem. Ztg.*, 38 (1914), No. 35, *Repert.*, p. 157).—Five gm. of water-free sodium sulphate is weighed in a weighing bottle and 5 cc. of the wine under examination is added. After the sodium sulphate has become fully solidified the glass and its contents are placed open in a vacuum desiccator which contains about 15 cc. of sulphuric acid for each 5 cc. of wine dried, and exhausted to about 15 to 20 mm. pressure. After 12 to 14 hours dry air is allowed to enter the desiccator, and the weighing flask is then stoppered and weighed. As sodium sulphate retains a little water a control test is made without wine for the purpose of obtaining the correction necessary. The method yields good results with dry wines.

See also previous notes (*E. S. R.*, 32, pp. 608, 609).

The specific heat of milk and milk derivatives, B. W. HAMMER and A. R. JOHNSON (*Iowa Sta. Research Bul.* 14 (1913), pp. 451-463, figs. 6).—A better knowledge of the specific heat of milk and milk derivatives is deemed of the greatest importance in the conduct of various processes (pasteurizing, refrigeration, manufacturing and storing butter, and manufacturing ice cream) in the dairy industry. Two methods for determining the specific heat were evolved and these are described and the apparatus used therefor illustrated.

The samples of milk used in the tests were from the composite milk delivered at the college creamery. The fat content varied from 3.4 to 4.9, most samples having about 4.3 per cent. The whey used was from composite milk and obtained from the cheese vat, and contained from 0.25 to 0.3 per cent of fat. The creams used were separated from composite milk in the morning and kept in the refrigerator until evening when the various tests were carried out. Skim milk varying in fat content from 0.3 to 0.38 per cent was also tested. The butter fats used for the specific heat determinations were taken from the churnings on three different occasions and contained the ordinary amounts of curd, salt, water, and fat, and two other samples were carefully prepared in accordance with the specifications of the official method of analysis.

The results obtained are summarized as follows:

Specific heats of milk and milk derivatives (including heat required to melt fat, if this factor enters).

Kind of milk product.	At 0° C.	At 15° C.	At 40° C.	At 60° C.
Whey.....	0.978	0.976	0.974	0.972
Skim milk.....	.940	.943	.952	.963
Whole milk.....	.920	.938	.930	.918
15 per cent cream.....	.750	.923	.899	.900
20 per cent cream.....	.723	.940	.880	.836
30 per cent cream.....	.673	.983	.852	.860
45 per cent cream.....	.606	1.016	.787	.793
60 per cent cream.....	.560	1.053	.721	.737
Butter.....	<i>a</i> .512	<i>a</i> .527	.556	.580
Butter fat.....	<i>a</i> .445	<i>a</i> .467	.500	.530

a These values were obtained by extrapolation, under the assumption that the specific heat is about the same in the solid and liquid states.

"Heretofore it has been customary to use a certain value for the specific heat of milk or cream, without paying any attention to the temperature range over which the material is to be heated or cooled. This is obviously wrong, because the range plays a very important part from the standpoint of the apparent specific heat value, and for that reason the above table was prepared, although it is recognized that certain of the values may be in error because of the assumptions that have been necessary. In addition to giving the values at certain temperatures, the table gives the values over various ranges; these were obtained by averaging the values for every 3° C. . . . Butter fat is composed of a number of constituents which melt at different temperatures, and the abnormal values for specific heats include the latent heats of fusion of the components of the fat." The highest specific heat found over a wide temperature range is in close agreement with the variations in the results that have been obtained for the melting point for butter fat by various investigators.

"For many practical purposes the apparent specific heat is of as great value as the true specific heat, provided the value obtained for a particular temperature interval is obtained while applying the heat at such a rate that all of the material meltable in that particular range becomes entirely melted and equilibrium is established. . . . The values near the freezing point of water are of importance in their bearing on the question of the relation of the specific heats of ice cream mixes to the effect on the palate. An ice cream very rich in fat would not only have a low specific heat at low temperature, but, as is apparent from the very great slopes of the specific heat curves and the high maximum reached, it would adsorb heat rapidly with an increase in temperature. From the data obtained and disregarding other factors it appears that an ice cream carrying considerable fat, when first coming in contact with the warm palate and tongue, would give a sensation that was not disagreeably cold. Then as the temperature increased because of the adsorption of heat by the fusion of the fats the mass would be automatically maintained cold longer than it otherwise would remain. In short, there is no sensation of extreme coldness, but still the mass remains cold for a longer time than if smaller amounts of fat were present. On the other hand, with low fat ice creams and sherbets there is a sensation of extreme coldness when the material is first taken into the mouth, but the mass soon warms up."

The specific heat values for milk and milk derivatives collected from the dairy literature are tabulated.

A rapid method for determining crude fiber, H. KALNING (*Ztschr. Gesam. Getriedew.*, 5 (1913), No. 1, pp. 6-8; *abs. in Chem. Ztg.*, 38 (1914), No. 11, *Repert.*, p. 48).—The method is a modification of Weender's. It consists of diluting the mixture with water after each boiling, and, after settling, filtering the supernatant fluid through gauze. The residue in the flask is placed in a folded filter, and after the fluid has been filtered off it is retransferred to the dish and finally placed in a tared folded filter and weighed after drying. See also a previous note by Stiegler (*E. S. R.*, 32, p. 314).

Colorimetric test for uric acid in the urine, H. F. Host (*Norsk Mag. Lægevidensk. Med. Selsk. Kristiania*, 75 (1914), No. 7, pp. 783-791, fig. 1; *abs. in Jour. Amer. Med. Assoc.*, 63 (1914), No. 8, p. 714).—A tabulation of the author's "findings with simultaneous application of the various color tests in vogue. They show that the Riegler method^a is especially simple and reliable when the technique is slightly modified, as he describes, to render the reagent more durable. It is a 1 per thousand solution of uric acid made by dissolving 0.1 gm. uric acid in a little distilled water in a 100-cc. graduated flask; adding

^a *Ztschr. Analyt. Chem.*, 51 (1912), No. 7-8, pp. 466-470.

10 cc. of a 0.4 per cent solution of lithium carbonate; and heating for ten or fifteen minutes until the uric acid is dissolved. Then the vessel is filled up to the mark. This solution keeps for a week. He precipitates the uric acid as ammonium urate. Otherwise the technique is the same as Riegler's."

A source of error in the Clerget polarization, V. STANĚK (*Ztschr. Zucker-indus. Bohmen*, 38 (1914), No. 6, pp. 289-298; *abs. in Chem. Ztg.*, 38 (1914), No. 47, *Repert.*, p. 221).—Herzfeld's figure, 132.66, for the half-normal weight at 20° C., is noted five minutes after filling to the mark. If, however, the solution is allowed to stand for from 10 to 35 minutes the constant obtained is 0.4 per cent higher, since the rotation, as Gubbe showed in 1884, requires a certain time to arrive at a maximum, and consequently a definite time must elapse before the reading is taken. The author requests the International Commission, which is engaged in a study of the constant, to pay particular attention to this factor.

The comparative value of various germicides for use in cane sugar factories, W. L. OWEN (*Louisiana Stas. Bul.* 153 (1915), pp. 54).—These studies were made with fresh and fermented juices, sirup, and deteriorated sugar. Formaldehyde was found to be superior to calcium hypochlorite, ammonium fluorid, sodium fluorid, milk of lime, bisulphite of lime, and bisulphite of soda for disinfecting sirup tanks or in removing the micro-organisms causing deterioration in sugars. Milk or chlorid (hypochlorite) of lime may be substituted for formaldehyde for cleaning tanks at a reduction of cost per unit of efficiency.

"In cases where the efficiency of the germicide involves any great penetrating power, as, for example, where gums are to be removed, chlorid of lime is a more economical germicide than formaldehyde. Since the efficiency of all germicides is greater at elevated temperatures, they should always be applied hot in cleaning sugar factories. The comparatively high germicidal efficiency of milk of lime, combined with its very low cost and the fact that it is always on hand in sugar factories, renders it particularly suitable as a sugar factory germicide."

A bibliography is appended.

METEOROLOGY.

Temperature records, J. B. THOMPSON (*Guam Sta. Rpt.* 1914, pp. 17, 18, *figs.* 2).—Maximum and minimum monthly temperatures at the Guam Station during the year ended June 30, 1914, are shown in tables and diagrams.

Ohio weather for 1913, J. W. SMITH and C. A. PATTON (*Ohio Sta. Bul.* 277 (1914), pp. 331-406, *figs.* 54).—The temperature and precipitation throughout the State during each month are shown in charts. The usual summary tables are given showing temperature and rainfall at Wooster and throughout the State (1888 to 1913).

The mean temperature for the year at Wooster was 50.6° F.; for the State, 52.3°. The highest temperature at the station was 96°, June 30 and August 17; for the State, 105°, June 30. The lowest temperature at the station was -2°, February 6; for the State, -15°, February 6. The annual rainfall at the station was 51.18 in.; for the State, 44.75 in. The number of rainy days at the station was 134; for the State, 120. The prevailing direction of the wind was southwest at the station and in the State at large.

Meteorological summary for the year 1913 (*Wyoming Sta. Rpt.* 1914, pp. 166-175).—Monthly summaries are given of observations at Laramie, Wyo., during 1913 on temperature, pressure, precipitation, humidity, sunshine, cloudiness, and wind movement. A record of soil temperature at depths of 3, 6, 12,

24, 36, and 72 in. during 1913 is also given. The growing season of 1913 was somewhat longer, the precipitation greater, and the wind velocity less than normal.

The first killing frost occurred September 17, which is later than usual. A summer frost occurred the night of July 31. The highest temperature was 89° F., July 6; the lowest, -30°, January 7. The total precipitation was 13.61 in., as compared with a 20-year average of 10.21 in. The lowest relative humidity was 15 per cent, July 2. The greatest velocity of wind was 60 miles per hour, June 11.

Salient features in the geological history of Australia, with special reference to changes of climate, W. G. WOOLNOUGH (*Off. Yearbook Aust.*, 7 (1901-1913), pp. 56-58).—The evidences of climatic variations during the different geological ages in Australia are briefly summarized.

SOILS—FERTILIZERS.

The present status of soil chemistry, with particular reference to organic compounds, S. L. JORDI (*Landw. Vers. Stat.*, 85 (1914), No. 3-4, pp. 359-391).—This article is based mainly on investigations conducted by the author at the Iowa and Michigan experiment stations (E. S. R., 22, p. 618; 25, p. 622; 26, pp. 320, 615, 616; 28, p. 813; 29, pp. 124, 316, 723; 30, p. 122).

The topics discussed are the sulphur compounds of the soil, the influence of meteorological and biological factors on the soil nitrogen, the older and the more recent theories regarding the nature of humus and its behavior with certain reagents, genetic relations between the chemical compounds in soil and those in plants and animals, the nature of nitrogen compounds in the soil, the organic nitrogen compounds of the soil, the separation of the nitrogen compounds in sulphuric-acid extracts of the soil, cleavage products of nucleo-proteins, lecithin products in the soil, pyridin derivatives in the soil, the ammonification of amino-acids and acid amids in the soil, the occurrence of carbon dioxid, alcohols, and aldehydes in the soil, and soil organic acids.

A list of 71 references to literature bearing on the subject is appended.

On the origin of the loess of southwestern Indiana, E. W. SHAW (*Science*, n. ser., 41 (1915), No. 1046, pp. 104-108).—The author concludes from a study of the loess areas of the United States "that the so-called marl loess of southwestern Indiana consists of wind-deposited true loess, stream-laid valley filling, and dune sand, and that the true loess part of it, together with the 'common loess,' corresponds to the well-known loess of other parts of the Mississippi basin."

Composition and origin of different horizons of some South Russian soils and subsoils, A. I. NABOKIKH (*Selsk. Khoz. i L'šov.*, 237 (1911), Nov., pp. 367-379; 238 (1912), Jan., pp. 3-17; Mar., pp. 399-414; 239 (1912), May, pp. 3-14; June, pp. 159-180, fig. 1; July, pp. 289-305; abs. in *Zhur. Opytn. Agron.* (*Russ. Jour. Expt. Landw.*), 14 (1913), No. 4, pp. 342-347).—The author deals mainly with the varying humus content of the soils as determined by the permanganate method.

A so-called isohumic zone of forest soils containing from 1 to 2 per cent of humus embraces the Governments of Kiev and Volynsk. The adjoining borderland of loess podzol clays contain not less than 2 per cent, often more than 3 per cent of humus. The soils intermediate between forests and steppes vary in humus content from that of the forest soils on the north to that of the chernozem steppes of the south. The steppes soils are divided into (1) those of the north covered with typical chernozem with 5 to 9 per cent of humus; (2) the brown soils of the coast steppes containing not more than 3 per cent of

humus, but which are frequently rich in alkali (chlorids, sulphates, and carbonates); and (3) the intermediate chestnut soils containing 3 to 5 per cent of humus.

The value of excavated subsoil (Kuhlerde) for the agricultural improvement of upland moor soils, B. TACKE (*Mitt. Ver. Förd. Moorkultur Deut. Reiche*, 32 (1914), No. 22, pp. 395-407).—The author briefly describes the process of excavating and mixing the deep subsoil with the surface soil of the upland moors in northwest Germany and reports crop experiments with oats, rye, and potatoes on these soils with different manurial treatments. He states that the moor soils are acid and poor in plant food, but that the subsoils are well stocked with plant food, which is made more or less available when intimately mixed with the moor soil and subjected to proper manurial treatment and cultivation. This process apparently requires several years time, however, as is shown by nine years' of cropping experiments, but in the end important quantities of potash and phosphoric acid are made available for plants.

A simple method for determining the critical moisture content of soils, R. O. E. DAVIS (*Jour. Indus. and Engin. Chem.*, 6 (1914), No. 12, pp. 1008-1010, figs. 2).—The method proposed depends upon the rise of water by capillarity a short distance in a column of dry soil and the subsequent distribution of the water in the soil.

A brass tube 1 ft. long and 1 in. in diameter is filled with the soil and suspended in water until the water has risen several inches in the tube. The tube is then removed and held in a horizontal position until capillary movement practically ceases, then moisture is determined in the inch of soil at the extreme point to which water has advanced. The percentage so found is taken to be the critical moisture content. To facilitate the operation the brass tubes are split in half, so that they can be separated and the entire soil column obtained for examination, and have a slit covered with celluloid to permit of observation of the movement of the water in the soil.

The method is considered simpler and more accurate than older methods for the purpose.

Two equipments for investigation of soil leachings, C. A. MOOERS and W. H. MACINTIRE (*Tennessee Sta. Bul. 111* (1915), pp. 8, pls. 4).—Two types of equipment for investigating soil leachings are described and illustrated.

The first, a pit equipment, consists of an oblong covered cement pit 81.5 ft. long, 5.3 ft. wide, and 6.5 ft. high. Thirty-four heavy galvanized iron soil drainage tanks are sunk in the ground on both sides of the pit. These are 1, 2, 4, and 6 ft. in depth, and are provided with block tin outlets which pass through the pit wall and empty the drainage water into galvanized-iron cans inside.

The second, a hillside equipment, is based upon a 6-ft. perpendicular concrete wall built against the side of a terrace in which the soil drainage tanks are sunk. The tanks are made of 14-gage galvanized ingot iron, strengthened at the top by means of a 3/16 by 3/4-in. wrought-iron band, and having a surface area of 1/20,000 acre. There are two sets of these tanks, viz, 21 12 in. deep, embedded 8 in. in the soil, and 23 24 in. deep, embedded 20 in. in the soil. Block tin tubes connected with the bottom of the tanks pass through the retaining wall and empty the drainage water into containers arranged along the wall in a covered subway. This subway is open on the side opposite the retaining wall, but is so arranged that the containers are protected from direct sunshine and other extreme weather conditions.

Ammonification and nitrification in Hawaiian soils, W. P. KELLEY (*Hawaii Sta. Bul. 37* (1915), pp. 52).—This bulletin reports studies on ammonification and nitrification in Hawaiian soils under a variety of conditions.

It was found that, as a rule, nitrification was not very active in untilled soils. Ammonification was much more active than nitrification in such soils. The inactivity of nitrification in the uncultivated soils was not due to acidity or lack of organisms, but largely to deficient aeration. Tillage improved the aeration and thus stimulated nitrification as well as ammonification. Sterilization by heat did not promote nitrification but increased the production of ammonia. Partial sterilization stimulated ammonification for a short time, usually about two weeks, after which there was a decline in ammonification. Nitrification was temporarily inhibited by partial sterilization, but later recovered its activity. Reinoculation of the partially sterilized soil with untreated soil stimulated nitrification without checking ammonification. Partial sterilization caused a permanent increase in available nitrogen (nitrates and ammonia) in certain soils and a temporary increase in others.

Calcium carbonate produced considerable stimulation of ammonification of dried blood and soy-bean meal in certain soils; in others it had little effect in this respect. Magnesium carbonate, on the other hand, produced marked stimulation in the majority of cases. Dolomitic and calcareous limestones produced much the same effects as calcium carbonate.

Calcium carbonate stimulated nitrification in certain soils and was without effect in others. Magnesium carbonate was toxic to nitrification in the majority of cases. Nitrification was as active in the manganiferous and titaniferous soils as in the others studied, but magnesium carbonate was especially toxic to nitrification in these soils, this effect being more marked in the case of soy-bean meal than in the case of dried blood. Dolomitic and calcareous limestones and calcium carbonate produced similar effects as regards nitrification.

The results regarding the effect of the lime-magnesia ratio on ammonification and nitrification were inconclusive.

In general, the experiments emphasize the importance of maintaining the best aeration possible in Hawaiian soils.

The lime-magnesia ratio.—I, The effects of calcium and magnesium carbonates on ammonification. II, The effects of calcium and magnesium carbonates on nitrification, W. P. KELLEY (*Centbl. Bakt. [etc.]*, 2. Abt., 42 (1914), Nos. 17-18, pp. 519-526; 21-22, pp. 577-582).—The experimental results contained in these two articles are reported for the most part in the above. The general conclusion is reached that the lime-magnesia ratio is not of great importance to the ammonifying and nitrifying flora of the soil. The concentration of magnesium in solution and its relations to the concentration of the other constituents are of more importance.

The influence of arsenic upon the nitrogen-fixing powers of the soil, J. E. GREAVES and H. P. ANDERSON (*Centbl. Bakt. [etc.]*, 2. Abt., 42 (1914), No. 10-14, pp. 244-254, fig. 1).—In continuation of previous studies on the influence of arsenic compounds on the soil flora (*E. S. R.*, 30, pp. 423, 424) the authors found that arsenic when applied to a soil in the form of lead arsenate, sodium arsenate, arsenic trisulphid, or zinc arsenite, stimulates the nitrogen-fixing powers of the soil, this effect being greatest with lead arsenate and least with zinc arsenite. Paris green did not stimulate in any of the concentrations tested and became very toxic at a concentration of 120 parts per million. Sodium arsenate became toxic at a concentration of 40 parts per million and at 250 parts per million nitrogen fixation was entirely stopped. Lead arsenate was not toxic even at a concentration of 400 parts per million, and the toxicity of arsenic trisulphid and zinc arsenite was very small at this concentration.

"The stimulation noted . . . is not due to any inherent peculiarity of the soil used, for soils which vary greatly in physical and chemical properties had their nitrogen-fixing powers greatly increased when arsenic was applied to them.

Soils high in organic matter fixed as much nitrogen in the presence of arsenic and in the absence of mannite as they did in the presence of mannite and absence of arsenic. The stimulation is greatest when the water-soluble arsenic content of the soil is about 10 parts per million; this quantity exceeds that found in most soils, so it is likely that arsenic will stimulate in place of retard bacterial activities of soil.

"Only one type of *Azotobacter* was isolated which was stimulated by arsenic, and in this case the stimulation was due to the organism utilizing more economically, in the presence of arsenic, its source of carbon than it did in the absence of arsenic. Arsenic does not act as a source of energy to the organism. Part of the stimulation noted in the soil with its mixed flora is probably due to the arsenic inhibiting injurious species. A quantity of arsenic which acts as a stimulant to bacteria when placed in soil may become very toxic when tested by the Remy solution method."

Bacteriological effects of green manures, C. F. BRISCOE and H. H. HARNED (*Mississippi Sta. Bul.* 168 (1915), pp. 20, figs. 7).—This bulletin gives a general discussion of the relation of humus to soil bacteria and reports a series of experiments in stone jars which was designed primarily to test the effect of green manures and stable manure on the rate of nitrification in soils. One series of jars was arranged for the bacteriological tests and the other was cropped with oats as a check on the bacteriological tests.

The results indicated a direct relation between the bacterial count and the amount of organic matter added to the soil. There was a very uniform agreement between the bacteriological and the vegetative tests. It was found that a light dressing of stable manure with green manure produced marked effects as shown both by the crop tested and the bacterial count. The use of a bacterial culture with the green manure had as pronounced an effect as the addition of a light dressing of stable manure, indicating that the benefit from the use of the stable manure was due largely to the addition of the bacteria contained in the manure. The addition of organic matter to the soil gave not only a larger growth but a better quality of oats as shown by determinations of nitrogen in the straw.

The effect of applying stable manure with green manures, O. LEMMERMANN and A. EINECKE (*Mitt. Deut. Landw. Gesell.*, 29 (1914), No. 52, pp. 702-704).—Contrary to a generally accepted view the experiments with sugar beets reported in this article did not indicate that applying stable manure with green manures (lupines and serradella) appreciably increases the effectiveness of the latter. Plowing under the green manures in spring gave better results than plowing under about the end of October. Plowing under to a depth of 11 in. gave better results than plowing under to a depth of 8.7 in. Taking the effect of nitrogen in nitrate of soda as 100, that of the nitrogen of the green manures was 44 and of stable manure 21.

[**Investigations on soils and fertilizers in Hawaii**], E. V. WILCOX and W. P. KELLEY (*Hawaii Sta. Rpt.* 1914, pp. 14-16, 21, 22, 25-27).—Brief summaries are given of the main results of investigations, including the effect of heating on soils (E. S. R., 30, p. 419), fertilizing rice (E. S. R., 30, p. 420), the nature of the nitrogenous compounds of soil (E. S. R., 31, p. 11), effect of fertilizers on the chemistry and physical properties of soils and on the fixation of fertilizing constituents by soils, and ammonification and nitrification in soils (see p. 719).

It is stated that "continued pot experiments with various forms of phosphate have demonstrated anew that soluble phosphates do not leach through the soils, but remain permanently available for plant growth. It was also shown that

legumes used as green manure greatly increased the availability of rock phosphate."

In comparative tests of various green manure plants it was found that an introduced leguminous weed known as rattlepod (*Crotalaria saltiana*) "has the advantage over cultivated legumes that the seed may be sown without any previous preparation of the soil and of course without cultivation after seeding. . . . On several plantations fields which had become the poorest on the whole plantation gave the largest yield during the past year as a result of plowing under humus-forming material, but without applying excessive amounts of commercial fertilizers."

Radio-active fertilizers (*Sci. Amer. Sup.*, 79 (1915), No. 2038, p. 53).—Investigations by Stoklasa, noted elsewhere (*E. S. R.*, 31, p. 821), are reviewed.

Dogfish and how it is made into fertilizer, L. H. MARTELL (*Canad. Fisherman*, 2 (1915), No. 1, pp. 6-8, figs. 2; *Amer. Fert.*, 42 (1915), No. 8, pp. 54, 56, 58).—The progress made by the Canadian Government in efforts to utilize the dogfish for the manufacture of oil and fertilizer and thus reduce the menace to fisheries are discussed, and the methods used are described. It is stated that in the factories established at Canso and Clark's Harbor, Nova Scotia, and Shippegan, New Brunswick, the feasibility of so utilizing the dogfish has been demonstrated, but that the further development of the industry will probably be left to private enterprise.

The fertilizing value of feathers, F. PILZ (*Wiener Landw. Ztg.*, 64 (1914), No. 83, p. 762).—Data collected from various sources regarding the fertilizing value of feathers are summarized in this article. The analyses given indicate that feathers contain on an average about 14 per cent of nitrogen and small amounts, not more than 0.5 per cent in the aggregate, of phosphoric acid, potash, and lime. In view of the unavailable character of the nitrogen of feathers it is stated that they can best be utilized in composts.

Substitutes for ráb, J. B. KNIGHT (*Dept. Agr. Bombay Bul.* 63 (1914), pp. 19).—Ráb is the term applied to the practice of burning materials like loppings of trees or dried dung upon rice seed beds before planting the seed. Tests of lime, salt, charcoal, well-rotted cow manure, sheep manure, poudrette, ashes, ammonium sulphate, superphosphate, niter, and fish and oil cakes as substitutes for ráb are reported. The results indicated that fish, niter, ammonium sulphate, and oil cakes are the most promising of the substitutes tested, but that poudrette, sheep manure, and decomposed cow manure well mixed with the soil are to be recommended.

Germany's artificial fertilizers (*Ztschr. Ver. Deut. Ingen.*, 58 (1914), No. 40, p. 1443; *Jour. Indus. and Engin. Chem.*, 7 (1915), No. 1, p. 74).—It is shown that Germany has a practical monopoly and an abundant supply of potash. The situation is not so favorable with reference to nitrogen, but the production of ammonium sulphate is rapidly increasing and the practicability of preparing nitrogen compounds from the air has been demonstrated, although there has not yet been any great commercial development of such processes. It is stated that Germany controls in the Haber process of synthetic production of ammonia one of the cheapest and most practical methods of producing nitrogen compounds. The phosphoric acid required is supplied by Thomas slag, a by-product of steel manufacture, and Germany is independent with reference to this fertilizing constituent as long as the steel factories are active.

Air nitrate, K. W. JURISCH (*Über Luftsalpeter. Leipzig: H. A. L. Degener* [1914], pp. 20, figs. 15).—The industrial development of the manufacture by electrical means of nitrates from the free nitrogen of the air by the Birkeland and Eyde and especially the Schönherr processes is reviewed and an extensive bibliography of references to literature and patents is given.

Red soils and phosphatic manures, J. ARIÉ (*Bol. Agr. [São Paulo]*, 15. ser., No. 6-7 (1914), pp. 535-555, figs. 2).—The author cites analyses of 48 samples of red soils which show that these soils are generally deficient in phosphoric acid. He points out that although they rapidly absorb soluble phosphatic fertilizers, the latter usually combine with the iron and aluminum of the soils to form insoluble compounds.

He further reports experiments to show that the absorption of phosphoric acid in red soils is considerably increased by the presence of lime and humus and that the solubility of the phosphates of aluminum, iron, and slag in solutions of so-called alkaline humates increases with the concentration of the solution. It is thought that the humus prevents the formation of insoluble phosphatic compounds in red soils by combining with the phosphoric acid and forming easily soluble so-called humo-phosphates. The value of liming on red soils is attributed mainly to its favorable influence on bacterial activity and on the solubility of potash.

It is concluded that superphosphate may be profitably used on red soils if accompanied by liberal additions of organic matter and lime.

The white phosphates of Tennessee, J. S. HOOK (*Resources Tenn.*, 5 (1915), No. 1, pp. 23-33, figs. 4).—The character, geological relations, origin, and distribution of the white phosphate deposits occurring in Perry and Decatur counties, Tennessee, are discussed. Sufficient investigation has not yet been made to determine definitely the extent of these deposits. The deposits are so irregular and uncertain in character that no reliable postulations can be made as to the extent and size of the individual deposits.

Phosphatic fertilizers and the deposits of apatite of Freirina, J. BRÜGGEN (*Los Abonos Fosfatados i los Yacimientos de Apatita de Freirina. Santiago de Chile: Soc. Nac. Min.*, 1914, pp. 12, pl. 1).—This article discusses briefly the sources, character, and fertilizing value of various phosphatic fertilizers, and describes in some detail what appear to be large deposits of high-grade apatite occurring in the Department of Freirina, Chile. A considerable part of this apatite contains from 25 to 29 per cent of phosphoric acid and some of it as much as 35 per cent.

American imports of potash salts (*U. S. Dept. Com., Com. Rpts.*, No. 17 (1915), p. 293).—The import into the United States during December, 1914, of muriate of potash was 8,313 tons, sulphate of potash 2,204 tons, other salts 503,349 tons, as compared with 28,619, 6,459, and 695,373 tons, respectively, during December of the preceding year.

The economic value of Pacific coast kelps, J. S. BURD (*California Sta. Bul.* 248 (1915), pp. 183-215, figs. 3).—This bulletin reports in part the results of an extensive series of studies on the chemistry of kelps, discussing these results from the standpoint of their bearing on the commercial utilization of kelp.

The following are the general conclusions reached: "The giant kelps contain potassium, iodine, and nitrogen in amounts which will possibly justify commercial recovery. Estimates of potash yields which are based on analyses of leaves and stems and do not take into account the larger proportion of leaf to stem in the growing plant are likely to be higher than can be expected in the average run of commercial recovery. Exact determinations of the moisture content of the more common of the giant kelps, here presented for the first time, show that weight for weight of fresh kelp *Macrocystis pyrifera* contains more of each important constituent than does *Nereocystis luetkeana*.

"The efflorescence of potash salts when kelps are slowly dried can not be utilized to advantage in the commercial preparation of potash if a large yield of high-grade salts is desired. No technological difficulties are involved in prepar-

ing high-grade potash salts and iodine from kelp, but exact costs of production can only be arrived at from data obtained on a large scale, as in actual factory practice. Apparently, however, extraordinary profits are not to be expected owing to the limited value of the product and the large amount of manipulation involved in the various methods of recovery.

"Air-dried kelp will furnish a low-grade potash fertilizer comparable to kainit and containing in addition over 1 per cent of nitrogen and 50 per cent of organic matter capable of furnishing humus to the soil. Objections to the use of dried kelp because of the presence of sodium and chlorine are untenable, because this material contains less sodium and chlorine than most of the commercial potash salts now being used and is but little inferior in this respect to the highest grades of muriate."

The relation of sulphur to soil fertility, O. M. SHEDD (*Kentucky Sta. Bul.* 188 (1914), pp. 595-630).—Determinations of sulphur in a large number of vegetables and fruits and other materials are reported showing widely varying but, in certain cases, considerable amounts of this constituent. For example, of 31 varieties of tobacco grown in Kentucky only two contained less sulphur than phosphorus. The larger proportion contained considerably more sulphur than phosphorus; in some cases twice as much. The average sulphur content of all the varieties examined was 0.458 per cent, the phosphorus content 0.302.

The addition of sulphur (100 and 500 lbs. per acre) or gypsum (equivalent to 100 lbs. of sulphur per acre) to fertilizers containing only nitrogen, potassium, and phosphorus produced a decided increase in yield in pot experiments with tobacco on a soil containing 240 lbs. of sulphur and 860 lbs. of phosphorus per acre. There were decided gains in the growth of soy beans with applications of sulphur, ammonium sulphate, pyrite, and ferrous sulphate and smaller gains with calcium, potassium, barium, magnesium, aluminum, and sodium sulphates on a soil containing 600 lbs. of sulphur and 3,040 lbs. of phosphorus per acre. The best results were obtained with the element sulphur. Pyrite and ferrous sulphate were applied at rates furnishing 6 lbs. of sulphur per acre; the other materials in amounts supplying 100 lbs. of sulphur per acre. The sulphur content of soy beans which responded to sulphur fertilization was in all cases higher than that of beans which had not been fertilized with sulphur. The sulphur fertilizers were also found to increase materially the growth of turnips following soy beans on the same soil.

Clover was not benefited by sulphur fertilizers on soil from the same source as that used in the experiments with soy beans. In a series of experiments with cabbage on soil, from the same source, to which were added in small amounts ferrous sulphid, disulphid, and sulphate and ferric sulphate and oxid, sulphates and carbonates of nickel, copper, cobalt, chromium, manganese, and lithium; ammonium, potassium, and sodium sulphocyanid; and flowers of sulphur none of the sulphur compounds except potassium sulphocyanid proved beneficial. A few of the substances used had no effect, while several were harmful. In similar experiments with mustard following the cabbage good gains in yield were obtained with several of the sulphates. With radishes following mustard the results were more irregular, but indicated benefit from sulphur fertilization in some cases. Experiments with alfalfa in sand cultures showed that this plant readily utilizes different forms of sulphur. The best results were obtained with magnesium, ferric sodium, potassium, and ammonium sulphates. Good results were also obtained with elementary sulphur. In nine out of fifteen cases the sulphates gave better results than the carbonates of the same element.

It was found that when sulphur was added to the soil it was rapidly oxidized to the sulphate (60 to 80 per cent in four months), the oxidation proceeding more rapidly in a fertile soil than in a poor soil. Sulphur was also oxidized

in sand cultures, but not to the same extent as in soil. The oxidation of the sulphur resulted in an increase of acidity. The organic sulphur of horse manure was slowly oxidized to sulphate.

The work of other investigators on the subject is briefly reviewed and a bibliography of the subject is given.

The action of salts of manganese on the growth of plants, P. ANDOUARD (*Bul. Sta. Agron. Loire-Inf.*, 1912-13, pp. 125-141).—Field experiments testing the effect of manganese carbonate (89 lbs. per acre) and sulphate (35.6 lbs. per acre) on the growth of beets, beans, and potatoes are reported, the results showing that the yield was in every case increased by the application of manganese salts. The increase was generally more marked with the carbonate than with the sulphate. The effect on the different constituents of the plants varied with the salt used.

[Inspection of fertilizers in Alabama], B. B. ROSS (*Ala. Dept. Agr. Bul.* 64 (1914), pp. 133).—Analyses and valuations of fertilizers collected during the inspection of 1913-14 are reported with brief discussions on the maintenance of soil fertility, classification of fertilizing materials, and home mixing of fertilizers. The text of the state fertilizer laws are included.

[Inspection of fertilizers in Florida], R. E. ROSE and F. T. WILSON (*Ann. Rpt. State Chem. Fla.*, 1914, pp. 54-106).—Analyses of fertilizers collected during the inspection of 1914 are reported.

Inspection and analysis of commercial fertilizers, 1914, F. B. MUMFORD and P. F. TROWBRIDGE (*Missouri Sta. Bul.* 122 (1915), pp. 109-160, fig. 1).—A list of fertilizers registered for sale in Missouri in 1914 is given and analyses and valuations of about 500 samples of these are reported with comments. There was a marked increase in the use of fertilizers in the State in 1914 over 1913. The deficiencies in nitrogen, phosphoric acid, and potash found by analysis, as compared with the guaranties, were greater in 1914 than in 1913, and in all constituents except potash greater than for the preceding five years. In 1914, 49.4 per cent of the nitrogen determinations, 28.2 per cent of the phosphoric acid determinations, and 27.6 per cent of the potash determinations were below the manufacturers' guaranties. However, the average value of all fertilizers examined in 1914, as calculated on the basis of their composition, was 57 cts. per ton above the average guaranty.

AGRICULTURAL BOTANY.

The evolution of sex in plants, J. M. COULTER (*Chicago: University Chicago Press*, 1914, pp. IX+140, figs. 46).—This is the first of a series of publications issued by the University of Chicago, in which it is intended to present summaries of experiments or specific investigations. The treatment of the topics is to be as nontechnical as possible, the series being intended for the layman as well as for the scientist.

In the present volume the author discusses asexual reproduction, the origin and differentiation of sex, evolution of sex organs, alternation of generations, differentiation of sexual individuals, and parthenogenesis. A working hypothesis is suggested regarding the theory of sex, and he concludes that sexuality as a method of reproduction represents protoplasts engaged in reproduction under peculiar difficulties that do not obtain in reproduction by spores or by vegetative multiplication. Its significance lies in the fact that it makes organic evolution more rapid and far more varied.

The mode of inheritance of semisterility in the offspring of certain hybrid plants, J. BELLING (*Ztschr. Induktive Abstam. u. Vererbungslehre*, 12 (1914), No. 5, pp. 303-342, figs. 17).—This is a study of semisterility as related to

abortion of young pollen grains and embryo sacs in three species and one variety of *Stizolobium*.

After discussing the particular and general effects of crossing in each of three generations, the author states that six families of the fertile plants have been grown on a large scale in the fourth and fifth generations, and all proved fertile, three of the lines obtained being of agricultural value. He presents a working hypothesis claimed to account for all facts at present known in this connection.

Plant chimeras, P. POPEOE (*Jour. Heredity*, 5 (1914), No. 12, pp. 521-532, figs. 9).—This is a discussion of so-called graft hybrids, including mention of early cases observed and later cases studied, recent experimental production of these chimeras with explanations of their behavior as regards chlorophyll characters and chromosome numbers, and mention of what is possibly the only genuine graft hybrid (*Solanum darwinianum*) now known.

Heredity in chimeras, W. S. CHAPIN (*Jour. Heredity*, 5 (1914), No. 12, pp. 533-546, figs. 7).—This is an account of the study of the progeny of a specimen of *Amaranthus retroflexus* which possessed variegated leaves and was regarded as a sectorial chimera. The offspring consisted of green, white, and a few variegated seedlings. Only green offspring were produced from green seedlings or green branches, and white branches when self-fertilized (cross-fertilization not being tried) produced only white offspring. It is thought that the heredity of this plant belongs to the type of variegated chimeras, the variegated plants coming from a cross between green and white gametes.

Bud variations in Coleus, A. B. STOUT (*Abs. in Science*, n. ser., 41 (1915), No. 1048, p. 178).—The author states that plants propagated vegetatively through six generations develop two types of changes, fluctuations and mutations. Although the different patterns which arose were remarkably constant in vegetative propagation, each exhibited further changes in the epigenetic development and distribution of the red pigmentation. The phenomena associated with the appearance and subsequent behavior of the different bud variations are quite similar to the phenomena of variation, mutation, and alternative inheritance in a seed progeny of hybrid origin.

Inheritance of certain seed characters in corn, R. A. HARPER (*Abs. in Science*, n. ser., 41 (1915), No. 1048, pp. 177, 178).—The author states that the various pigmentations of the integument, aleurone layer, and endosperm are metidentical characters, that is, the same in the cells as they are in the tissues or kernel as a whole. The pattern in the case of streaked or mottled grains is a character of the tissue as a whole. The form of the dent kernels is a character of the kernel due to the nature and distribution of the starch and other elements in the tissues. The wrinkled form of the kernels of sweet corn is more nearly identical with the shrinkage of the individual cells of the endosperm. By crossing these different forms intermediates may be obtained between any two contrasting characters, and selection tends to develop fixity of type, although the range of variation may at first be even higher than that of either parent.

Inheritable variations in the yellow daisy, A. F. BLAKESLEE (*Abs. in Science*, n. ser., 41 (1915), No. 1048, p. 178).—From a study of the yellow daisy (*Rudbeckia hirta*) the author has found a large number of ray characters, such as absence, reduplication, length, color, constriction, transformation of rays into tubes, and differences in shape, size, and color of disk, as well as vegetative characters, such as height, branching, leaf character, fasciations, etc.

Œnothera lamarckiana and the Œnotheras of the forest of Fontainebleau, L. BLARINGHEM (*Rev. Gén. Bot.*, 25 bis (1914), pp. 35-50, fig. 1).—The author

concludes an account of studies carried out on *Oenothera* by stating that there may be found in a wild state in France at least four distinct species of the group *Euoenothera*, namely (in order of frequency of occurrence) *O. biennis*, *O. suaveolens*, *O. biennis parviflora*, and *O. muricata*, *O. longiflora* not belonging to that group. *O. lamareckiana* is probably not found growing spontaneously in France.

A study of the genus *Panicum*, S. A. BELOV (*Trudy Būro Prikl. Bot. (Bul. Angew. Bot.)*, 7 (1914), No. 5, pp. 306-324, figs. 27).—Studies in water requirement as related to development at the agricultural station of Samara are said to show that *P. miliaceum* starts its main growth after wheat has passed its maximum, the principal root development of this millet corresponding with the latter part of stalk growth and with the early period of panicle formation.

Several other species of *Panicum* studied are said to fall naturally into three groups, in one of which there is considerable development of conducting tissue as compared with a given stomatal area, in a second, like development of conducting tissue with smaller stomatal area, and in the third, correspondence of stomatal area with development of conducting tissue.

Coloration of glumes in *Panicum miliaceum*, B. ARNOLD (*Trudy Būro Prikl. Bot. (Bul. Angew. Bot.)*, 7 (1914), No. 5, pp. 293-305, pl. 1, fig. 1).—This is an account of a series of comparisons made by the section for plant breeding at the Saratov Experiment Station regarding coloration of glumes in 265 pure strains within 23 varieties of millet, which were carried out with colors employed there as standards.

It was found that each variety of so-called red, yellow, and gray millet has a prevailing color tone, others showing lower degrees of conformity to type.

The relationships of root bacteria in the Leguminosæ, J. SIMON (*Centbl. Bakt. [etc.]*, 2. Abt., 41 (1914), No. 11-17, pp. 470-479).—A study of the relationships of nodule bacteria through their interaction with the leguminous hosts is said to divide the bacteria into groups, each form reacting with a certain number of hosts, which are indicated. The root bacteria of the Leguminosæ, it is held, are to be considered as more or less constant adapted forms of the species *Bacterium radiculicola*.

Isolation of *Bacillus radiculicola* from soil, C. B. LIPMAN and L. W. FOWLER (*Science, n. ser.*, 41 (1915), No. 1050, pp. 256-259).—A method is described by which the authors claim to have isolated *B. radiculicola* from soil in which there had grown for several years a large specimen of *Vicia sicula*. The organism was isolated, and inoculation experiments showed that in 21 out of 44 instances bacteria isolated from soil gave positive results, as shown by the presence of nodules on the roots of plants as grown in cultures. This is believed to be the first recorded instance where *B. radiculicola* has been isolated directly from the soil.

Physiological studies of *Bacillus radiculicola* of soy bean, J. K. WILSON (*Abs. in Science, n. ser.*, 41 (1915), No. 1048, p. 180).—This investigation is said to confirm other earlier work regarding the influence of nitrates on nodule production, and indicates that sulphates in relatively weak concentration inhibit the process. Chlorids and phosphates stimulate nodule production, while ammonium salts are inhibitory. It was determined that while nodule development was prevented by the presence of nitrates, sulphates, and ammonium salts, yet the organism retained its vitality in the presence of these salts. Whether the effect of the salt is upon the root, such as to make it more resistant, or upon the organism has not been determined.

Influence of certain salts on nodule production in vetch, KNO (*Abs. in Science, n. ser.*, 41 (1915), No. 1048, p. 180).—The author claims that calcium salts are essential for nodule production in vetch, although the substitution of

barium or strontium permits nodule development to a limited degree. The relation of a balanced solution to nodule production has also been investigated.

The assimilation of elementary nitrogen by yeasts and mold fungi, A. Kossowicz (*Biochem. Ztschr.*, 64 (1914), No. 1-3, pp. 82-85).—The author has followed up investigations previously reported (*E. S. R.*, 28, p. 35; 31, p. 223), and claims that the yeasts and mold fungi tested are able to utilize nitrogen compounds existing in the air, but not the free nitrogen thereof. He considers it doubtful whether yeasts or mold fungi exist which can utilize such atmospheric nitrogen.

Distribution of nitrates in *Phytolacca*, R. SPALLINO (*Ann. Chim. Appl. [Rome]*, 1 (1914), No. 11-12, pp. 502-505, pl. 1).—A preliminary study of the nitrate content in growing portions of *Phytolacca* at different stages is considered to show that nitrates in this plant have the character of reserve material, a relation being noted between the degree of leaf activity at a given stage and nitrate distribution in the plant.

The rôle of calcium in forest vegetation, L. CHANCEREL (*Rev. Gén. Bot.*, 25 bis (1914), pp. 83-89, pl. 1).—Giving a brief account of tests of the influence of several compounds upon the development of a number of common forest trees, the author states that calcium salts exercise an accelerating influence (not completely nutrient, but probably strongly stimulant) on a number of forest growths, producing notable results without injury in some instances. The maritime pine was found to accommodate itself to a high proportion of calcium and to show much greater vigor than in a siliceous medium. Chestnut was cultivated in a saturated solution of either sulphate or carbonate of calcium, which exercised a favorable influence on this plant. In general, while other conditions are influential, calcium compounds, particularly as sulphate or as phosphate, exercise a most important influence in silviculture.

Growth of plants in a medium rich in carbon dioxid, W. BERKOWSKI (*Gartenwelt*, 17 (1913), No. 51, pp. 707-709, figs. 2; 18 (1914), No. 33, pp. 445, 446, figs. 3).—Reporting experiments on several plants, the author states that increase of carbon dioxid in the atmosphere did not improve the appearance, flowering, or body weight of the plants tested.

On the nature of antagonism, W. J. V. OSTERHOUT (*Science*, n. ser., 41 (1915), No. 1050, pp. 255, 256).—The author presents a hypothesis formulated as a result of his investigations on the permeability of protoplasm, by which one may predict what substances will antagonize each other and what degree of antagonism will exist between any two substances. Substances which alter the permeability of protoplasm, it is said, may be divided into two classes, (1) those which cause an increase, but not a decrease, of permeability, and (2) those which can produce a decrease of permeability.

As a result of his investigations the author claims his hypothesis offers a rational explanation of antagonism by showing that salts antagonize each other because they produce opposite effects on the protoplasm and indicates definitely what the effects are. From this it is possible to predict, both qualitatively and to a considerable extent quantitatively, the effect of combinations of salts, but this may also be extended to organic compounds and to show that nonelectrolytes which decrease permeability can also antagonize such substances as sodium chlorid. This indicates that the hypothesis may be applied so as to include both electrolytes and nonelectrolytes.

Senile changes in the leaves of *Vitis vulpina* and certain other perennial plants, H. M. BENEDICT (*Abs. in Science*, n. ser., 41 (1915), No. 1048, p. 180).—Through investigations extending over a period of seven years, the author has found that leaves of *V. vulpina* and other plants exhibit evidence of senility. Leaves of old plants have a higher percentage of vascular tissue than leaves of

young plants, and consequently they are less efficient as photosynthesizing organs. He obtained a formula showing means for determining the age of *V. vulpina* from its veinage, as the age (age being reckoned from the last reproduction from seed) of a plant of *V. vulpina* determines the character of its veinage. The juvenile veinage is restored only after sexual reproduction.

The effects of kerosene and other petroleum oils on the viability and growth of *Zea mays*, J. H. WHITTEN (*Bul. Ill. State Lab. Nat. Hist.*, 10 (1914), Art. 5, pp. 245-273, pl. 1, fig. 1).—The author reports on several series of studies with *Zea mays* as affected by kerosene under different conditions.

Grains of corn were not injured by immersion in kerosene for from 10 to 20 days if they were then freed from adhering oil and given very little moisture during germination and initial growth. Dry, uninjured membranes were impermeable to kerosene, but moist membranes were not.

While some uninjured grains of corn may remain in kerosene for eight years without detriment, mechanical injury to the membranes permits destruction of life in the embryo by kerosene within 75 days.

Kerosene, while harmless in small proportions, was above these injurious to germinating grains in proportion to length of time of immersion and increase in water content of the soil above the minimum required for germination. Older seedlings absorbed safely larger quantities of kerosene. The injurious effects of petroleum oil on germinating seed corn seemed to vary inversely as the volatility of the respective oils.

It is not considered advisable to treat seed corn with kerosene unless the water content of the soil is under control.

Injuries to plants by smoke, gas, and ashes, H. C. MÜLLER ET AL. (*Ber. Agr. Chem. Kontroll u. Vers. Stat. Pflanzenkrank. Prov. Sachsen*, 1913, pp. 21-23).—This is a brief report on the chemical or physical injuries to various classes of useful or ornamental plants by gaseous and solid emanations from locomotives, electric plants, and other sources of abundant combustion products. The injuries due to nematodes, etc., attacking the plants weakened by the action of such products are included.

FIELD CROPS.

Report of the agronomy department, C. K. McCLELLAND and C. A. SAHR (*Hawaii Sta. Rpt.* 1914, pp. 36-42, pl. 1).—In a test with rice, a Japanese variety, Bezembo, and a Chinese variety, Long Nyah Yin, are noted.

"In an experiment with a sweet sorghum, a nonsaccharin sorghum, and Japanese cane for yields of forage over a long period, the sweet sorghum has yielded in four cuttings 47.1 tons per acre and the nonsaccharin variety 49.8 tons in three cuttings. The Japanese cane, cut for the first time, yielded 102 tons of forage per acre 453 days after planting."

Sudan grass planted November 22, 1913, is noted as yielding 31 tons of green forage at the first cutting, March 9, 1914, and 30 tons at the second cutting, May 8. Sudan grass seems to be much superior for lower and Tunis grass for higher elevations. Among other grasses "Mitchell grass (*Astrebla triticoides*), Judd grass (*Leptochloa virgata*), *Paspalum stoloniferum*, molasses grass (*Melinis minutiflora*), *P. virgatum*, *Phalaris bulbosa*, and Texas blue grass are worthy of mention. The American 'Buffalo grass' (*Bulbils dactyloides*) from Kansas seed started very slowly but is making much better growth as the summer months come on."

Three varieties of saltbushes are mentioned as having shown desirable qualities as sturdy, long-period cover crops, namely, *Atriplex nummularia*, *A. leptocarpa*, and *A. halimoides*. Trials with buckwheat, flax, and rape show these to be crops of value for Hawaiian conditions.

The trials of legumes include *Lupinus hartwegii*, which yielded at the end of 84 and 96 days, respectively, 9.8 and 18.6 tons green manure and 16.5 bu. seed per acre, *Trifolium alexandrinum*, *Desmodium tortuosum*, *Sanguisorba minor*, *Cytisus proliferus*, *Onobrychis sativa*, and *Lotus corniculatus*.

Agronomical investigations, E. V. WILCOX (*Hawaii Sta. Rpt. 1914, pp. 17, 18, 19, 20*).—This outlines the general scope of the agronomical work of the station, discussing the rice experiments, the unsatisfactory growth of cereals, the favorable prospects for Sudan grass, Giant Bermuda grass, teff grass, and saltbushes as forage plants, an unsatisfactory attempt to grow potatoes on account of blight, the excellent results with buckwheat and flax as farm crops, the increasing use of algaroba meal, and the increasing use of dynamite in improving soil conditions. The great value of the use of arsenite of soda as a spray to destroy weeds is also noted. The effect of arsenic on the soil is being studied.

Report of the eastern Oregon dry farming branch experiment station, Moro, Oregon, 1913-14, D. E. STEPHENS (*Oregon Sta., Rpt. East. Oreg. Dry Farming Sta., Moro, 1913-14, pp. 42, figs. 14*).—This bulletin embraces brief notes on the establishment of the eastern Oregon dry-farming substation at Moro, its equipment, and the climatic and soil conditions found there, including meteorological data.

Results of experiments that have been carried out along the lines of variety tests, tillage experiments, and crop rotations are given in detail and summarized as follows: "Improved strains of the Turkey winter wheat, in a 4-year period, have averaged 8 bu. an acre more than the local Fortyfold. For a 3-year period the Kharkov winter wheat has exceeded the best local Turkey wheat by 4.6 bu. an acre. Early Baart spring wheat and selections from Koola, Karun, and C. I. No. 2495 have given yields from 4 to 5 bu. an acre higher than the Selected Bluestem, the best local spring wheat. . . .

"The average yield of 63,000 acres of spring and winter barley in the Columbia Basin counties of Oregon in 1909, according to the U. S. Census, was 15.5 bu. an acre. The 4-year average yields of the Mariout, Hannchen, and Swan-neck spring barleys on the branch station farm have been 26 to 29 bu. an acre. . . . For a 4-year average the leading oat varieties have been Kherson, Canadian, Siberian, and Sixty Day. A selection of the Sixty Day in 1914 out-yielded the best local oat variety by 20 bu. an acre. Tests with winter and spring emmer indicate that this crop will not likely supplant oats and barley for stock feed in eastern Oregon. That field peas can be grown with profit on eastern Oregon dry lands has been demonstrated. The Carleton variety on the same ground in 1912, 1913, and 1914 averaged 19.3 bu. an acre, at present prices worth about \$35. . . .

"The best corn varieties for eastern Oregon conditions have been found to be Walla Walla White Dent, Northwestern Dent, Minnesota No. 13, Windus White Dent, and Yellow Flint. Corn varieties grown for a number of years and selected at the branch station have always given higher yields an acre than corn grown from seed of the same varieties obtained from distant localities.

"Alfalfa in cultivated rows has given promising results on the dry upland soils. The Baltic and Grimm varieties are recommended as best suited to eastern Oregon conditions.

"The permanency of the agriculture of eastern Oregon will depend upon the adoption by the farmers at some time of a crop rotation scheme that will increase and maintain the fertility of soil that is being depleted by continuous grain growing. Eighteen different crop rotation schemes are being tried at the

branch station; and, though further trials are needed before it can be decided which systems will be most profitable for farmers to adopt, results already obtained indicate that such crops as field peas, corn, and alfalfa in cultivated rows can, in a large measure, be substituted for summer fallow. In an extensive test of different cultivation methods for winter wheat under the summer fallow system it has been found that from 4 to 10 bu. an acre is gained by plowing the ground earlier in the spring than is the common practice."

Variety testing (*Washington Sta. Bul. 118 (1914), pp. 18-22, fig. 1*).—Data are given regarding variety tests of winter and spring wheat, winter and spring barley, oats, and field peas.

Grasses and forage plants of Hawaii, C. K. McCLELLAND (*Hawaii Sta. Bul. 36 (1915), pp. 43, pls. 9*).—This bulletin gives a detailed idea of the present status of forage plants on the various Hawaiian ranches. Tables show the average annual and monthly precipitation at some Hawaiian ranches and other points for periods ranging from 5 to 27 years; analyses and compiled data as to the composition of Hawaiian feeds; the Hawaiian, common, and botanical names of the more important grasses and leguminous and miscellaneous forage plants; the names of grasses introduced for range improvement but not yet established; and undesirable and poisonous plants. Descriptions of many of the forage plants are given and recommendations for planting are offered, together with brief notes on the management of range lands.

Forage crop studies, J. B. THOMPSON (*Guam Sta. Rpt. 1914, pp. 15, 16, pl. 1*).—This notes the production of Para grass, *Paspalum dilatatum*, Guinea grass, sorghum, and peanuts for soiling and pasture crops.

Brachysm, a hereditary deformity of cotton and other plants, O. F. COOK (*U. S. Dept. Agr., Jour. Agr. Research, 3 (1915), No. 5, pp. 387-399, pls. 10*).—In this article the author discusses facts discovered by observations of the cotton plants under the headings of special features of brachysm in cotton, independent origins of brachytic variations, different degrees of brachysm, shortening of internodes by drought, retention of blasted buds in brachytic varieties, morphology of decurrent pedicels, brachysm accompanied by fasciation and adhesion, analogy between brachytic variations and hybrids, brachysm and homoeosis, and agricultural defects of "cluster" cottons.

In conclusion it is stated that "brachysm is a term proposed to designate the shortening of the vegetative internodes of plants. It is a hereditary abnormality, indicating degeneracy, that has appeared in independent mutative variations in many distinct families of plants, including many cultivated forms. Brachytic variations are of frequent occurrence in cotton, giving rise to the so-called 'cluster' and 'limbless' varieties, and afford unusually favorable opportunities for learning the nature and physiological significance of such variations.

"The shortening of the internodes of the cotton plant is usually confined to the fruiting branches without affecting the main stalk or the vegetative branches. Brachytic variations occur independently in different species and varieties of cotton and do not constitute a natural group with a common origin.

"Brachytic varieties of cotton usually show other abnormalities of the internodes, leaves, and involucre bracts. There is also an increased tendency to abortion of the floral buds, and the blasted buds often remain attached to the plant, because of the absence of well-differentiated absciss layer at the base of the pedicel.

"Though brachytic variations arise by mutative changes in the expression of the characters and show alternative Mendelian forms of inheritance, they afford no additional support to the general theories of mutation and Mendelism as explaining evolution. Such variations represent reduced specialization or

intermediate expression of characters and are degenerative in nature. They are not to be considered as examples of normal heredity or of the evolution of new characters. The abnormalities of brachytic variations are analogous to those found among hybrids and are likewise accompanied by tendencies to sterility or abortion of buds.

"Brachysm is to be associated with other forms of intermediate expression of characters, representing a general class of metaphasic variations. A more definite recognition of this class of variations is desirable in connection with the investigation of general problems of heredity and evolution.

"The agricultural value of brachytic varieties of cotton is impaired by the tendency to abnormal variations and sterility and also by the fact that the cluster cottons are more severely affected by unfavorable conditions. Hence, brachysm is to be avoided in the breeding of superior varieties of cotton."

Crimson clover: Seed production, J. M. WESTGATE (*U. S. Dept. Agr., Farmers' Bul. 646 (1915), pp. 13, figs. 13*).—This describes methods of harvesting the seed of crimson clover and also describes devices for gathering the seeds, known as comb strippers and rotary brush strippers.

Brief notes are given on the commercial growing of crimson clover seed and how to grow a good crop of seed, and the money values of a seed and hay crop are compared. The weeds to be avoided in a crimson clover field are mentioned and illustrated. Because of the uncertainties of the foreign supply of seed, it is suggested the individual farmer may readily arrange to save his own seed for reseeding, although the commercial production of seed in this country is handicapped by frequent untimely rains.

Local fertilizer experiments with corn in south Alabama in 1911, 1912, 1913, and 1914, J. F. DUGGAR and J. T. WILLIAMSON (*Alabama Col. Sta. Bul. 181 (1914), pp. 153–182*).—The chief object of these local fertilizer experiments is given as to ascertain the best combination of fertilizers for corn production on each of the principal soils of the southern half of Alabama.

"From these experiments, most of which were conducted on poor land in dry seasons, it appears that under these conditions reliance should not be placed chiefly on commercial fertilizers in growing corn. Commercial fertilizers have proved much more effective and profitable for cotton than for corn. On nearly all experiments nitrogen, whether employed as cotton-seed meal or as nitrate of soda, afforded a fair increase in the yield of corn. In 60 per cent of these separate experiments the increase from applying 200 lbs. of cotton-seed meal alone per acre was sufficient to afford a profit, even under these unfavorable conditions of soil and climate. Acid phosphate used alone, and in various combinations, usually afforded a small increase in the yield of corn, but this increase was usually not sufficient under these unfavorable conditions to afford a profit. For corn, kainit was even less effective and more generally unfavorable than was acid phosphate.

"When 200 lbs. of cotton-seed meal, applied before planting, was compared with 100 lbs. of nitrate of soda, applied when corn plants were several feet high, nitrate of soda afforded a larger increase. Nitrate of soda afforded, on the average, and in most experiments, a profitable increase in yield. In these experiments commercial fertilizers usually increased the yield to at least as large an extent on land capable of producing 25 to 30 bu. of corn without fertilizer as on poorer land; this suggests that it was the supply of moisture in the richer soils, rather than the fertilizers, which determined yield in these unfavorable seasons. This argues for the plowing under of organic matter in connection with the use of only moderate amounts of commercial fertilizers for corn.

"Considering other experiments, as well as these, the writers make the following general recommendations regarding the fertilization of corn: That so far as practicable stable manure and the remains of soil-improving plants, such as cowpeas, velvet beans, and crimson clover, be preferred to most kinds of commercial fertilizers. That the amounts of commercial fertilizer be limited. That most of the money invested in fertilizers be used in the purchase of nitrogen. That where a pound of nitrogen can be bought in nitrate of soda at the same or at a lower price than in cotton-seed meal, the preference be given to nitrate of soda as a fertilizer.

"That in view of results of unpublished experiments to determine the best time of applying nitrate of soda it is recommended that it be applied as a side application when the corn plants are between $2\frac{1}{2}$ and 4 ft. high. That on soils known to be deficient in phosphoric acid, and especially where heavy applications have not been applied to preceding crops, a moderate amount of acid phosphate be employed. That no investment be made in potash as a fertilizer for corn, especially at the high prices which will doubtless prevail in 1915, except where experience has shown the need of it.

"For the farmer wishing to make only a small investment in the fertilization of corn the following formula, for corn grown under average conditions, is suggested: 100 lbs. acid phosphate, before planting or by the time plants are $2\frac{1}{2}$ ft. high; 60 to 100 lbs. nitrate of soda, applied when the plants are $2\frac{1}{2}$ to 4 ft. high; or, 120 to 200 lbs. cotton-seed meal, applied at the same time as the phosphate, may be substituted for the nitrate of soda."

Local fertilizer experiments with corn in north Alabama in 1911, 1912, 1913, and 1914, J. F. DUGGAR and J. T. WILLIAMSON (*Alabama Col. Sta. Bul. 182 (1914)*, pp. 185-211).—This bulletin gives detailed data of experiments corresponding to the above on each of the principal soils of the northern half of Alabama.

The general conclusions noted above are repeated, except as follows: "On about half of the experiments nitrogen, when employed as cotton-seed meal, gave an increase sufficient to be profitable. Acid phosphate, like cotton-seed meal, gave small increases in most cases, but under the conditions of the unfavorable seasons these increases were profitable in only about 50 per cent of the experiments.

"Nitrate of soda, applied when the corn plants were 2 to 3 ft. high, and on plats which had previously received acid phosphate and kainit afforded, in 72 per cent of these experiments, a profit above the cost of the nitrate. Moreover, the complete fertilizer containing 100 lbs. of nitrate soda, 240 lbs. acid phosphate, and 100 lbs. kainit afforded a profit in 71 per cent of these experiments; but when nitrogen in a complete fertilizer was supplied in the form of cotton-seed meal, the resulting increase was sufficient to afford a profit in only 39 per cent of these experiments.

"In most of these experiments kainit at the rate of 200 lbs. per acre was the least profitable of the fertilizers tested. While this amount of kainit was usually unprofitable when used alone or with only one other fertilizer, yet in many of the experiments it proved slightly profitable as a part of a complete fertilizer containing nitrogen, phosphate, and potash.

Selecting and breeding corn for protein and oil in South Dakota, A. N. HUME, M. CHAMPLIN, and H. LOOMIS (*South Dakota Sta. Bul. 153 (1914)*, pp. 59-78, fig. 1).—This bulletin gives results of selection of corn for high and low protein and for high and low oil content of kernels, covering a period from 1910 to 1913, inclusive.

Comparative average yields of high protein and of low protein corn, 1910-1913, in bushels per acre, and pounds of protein per acre.

Year.	High protein corn.				Low protein corn.			
	Yield per acre.	Protein in seed planted.	Protein in corn harvested.	Yield of protein per acre.	Yield per acre.	Protein in seed planted.	Protein in corn harvested.	Yield of protein per acre.
	<i>Bushels.</i>	<i>Per cent.</i>	<i>Per cent.</i>	<i>Pounds.</i>	<i>Bushels.</i>	<i>Per cent.</i>	<i>Per cent.</i>	<i>Pounds.</i>
1910.....	44.6	13.14	13.11	379.13	39.2	13.14	11.20	284.98
1911.....	26.1	13.09	13.91	212.09	34.4	11.11	11.07	223.35
1912.....	53.7	13.91	12.89	411.83	46.3	11.07	12.46	343.27
1913.....	58.5	13.48	12.83	439.50	51.5	11.98	11.22	331.62
Average.....	45.7	.....	13.18	360.64	42.8	.....	11.49	295.80

The strain of corn selected for high oil content produced in 1911 an average of 86.83 lbs. of oil per acre and in 1912, 216.97 lbs. The percentage contents were 3.47 and 6.1, respectively. The strain selected for low oil content produced 61.59 lbs. of oil per acre in 1911 and 170.66 lbs. in 1912. The percentage oil contents were 3.15 and 5.66, respectively.

As a result of a study to determine the influence of degree of maturity on an oil content of corn it was found that corn harvested on August 15, September 4, and September 19 contained 3.272, 4.982, and 5.523 per cent, respectively, an average composite sample of 40 ears each. It is suggested that the degree of maturity at harvest may account for the wide differences in oil contents of the 1911 and 1912 crops above cited.

Cotton experiments, 1914 (*Mississippi Sta. Bul. 169 (1914), pp. 16*).—This bulletin gives results of cotton experiments similar to those previously noted (E. S. R., 29, p. 35; 31, p. 136). Results from the central station are reported by E. C. Ewing and J. R. Ricks. A table shows the monthly temperatures and rainfall for 1914. A table giving the results of a variety test shows four early, short staple varieties to range in yield of seed cotton from 1,287 to 1,570 lbs. per acre, eight medium early, big balled, short staple varieties to range from 1,303 to 1,589 lbs. per acre, and four long staple varieties to range from 1,154 to 1,430 lbs. per acre.

In regard to the values of the different varieties for local production of cotton it is stated "that under average conditions on poor thin land or land of medium fertility, with the boll weevil present, the medium early, big balled varieties such as Wannamaker Cleveland, Cook, Half and Half (a selection from Cook), and Miller will give better results than the very early, quick maturing varieties, which suffer worse from drought and rust and quit growing early under such conditions. Besides, there does not seem to be as much difference in earliness between the earliest and the latest varieties on thin land as there is between the earliest and the latest varieties on rich land. On rich bottom lands in the presence of the boll weevil, one of the early maturing varieties that does not make too much stalk will be the most satisfactory. In this class there are no better varieties than Trice and Dodd Prolific. In most tests in this State Trice has given better results than Dodd Prolific.

"We regard Express as the best available long staple variety for boll weevil conditions. It is an early inch and three-sixteenths cotton that has given splendid results in the Delta. Unknown is another good early variety that runs from an inch and an eighth to an inch and three-sixteenths."

The results of a test on wilt-infested land are reported, which show that "the wilt-resistant varieties generally gave the best yields in 1912 and 1913, but fell

below the susceptible varieties in 1914. This is on account of the effects of the boll weevil. The wilt-resistant varieties are all late and can not be successfully grown where weevil damage is heavy. At the same time the early varieties that we have found all seem to be rather susceptible to wilt, so the combination, where both wilt and weevils are present to a serious extent, makes cotton growing out of the question. The Covington-Toole wilt-resistant variety has yielded more cotton than any of the other wilt-resistant varieties in all tests that have been made with it at this station."

Cotton planted in rows spaced 3, $3\frac{1}{2}$, 4, $4\frac{1}{2}$, and 5 ft. apart yielded at the rate of 1,660, 1,336, 1,220, 1,200, and 1,176 lbs., respectively, of seed cotton. Cotton spaced 12, 24, and 36 in. in rows 4 ft. apart yielded at the rate of 1,553, 1,403, and 1,153 lbs., respectively, of seed cotton. "The weevils seemed to have gotten all of the squares after August 10."

In tests to prevent rust it was found that a plat receiving no treatment yielded at the rate of 484 lbs. of seed cotton per acre, one receiving 300 lbs. of kainit per acre yielded 1,732 lbs., one receiving 10 tons of barnyard manure in 1911 yielded at the rate of 1,808 lbs., and one receiving 10 tons of barnyard manure in 1913 yielded 1,830 lbs. of seed cotton per acre.

A test of 16 varieties of cotton at the Holly Springs substation, which is reported by C. T. Ames, gave yields ranging from 1,845.2 lbs. to 2,562 lbs. of seed cotton per acre. Cook Alabama Station variety produced the highest yield of seed cotton per acre and was second in percentage of lint (40 per cent), but the staple was only $\frac{3}{4}$ in. in length, the estimated valuation per acre being \$80.95.

The highest valuation per acre, \$96.79, was produced by Durango, with a total estimated yield of seed cotton of 2,111.2 lbs. per acre. Of this, 33.5 per cent was lint having a staple length of $1\frac{3}{8}$ in. The longest staple, $1\frac{5}{8}$ in., was produced by Sunflower, which yielded at the rate of 2,161 lbs. of seed cotton per acre, producing only 28.7 per cent of lint and having a total valuation of \$74.40 per acre. Half and Half produced the highest percentage of lint, 44.2, measuring $\frac{3}{4}$ in. in length, but yielded only 2,304.4 lbs. of seed cotton per acre, which brought the estimated valuation to \$78.40 per acre.

Tabulated results of fertilizer experiments which have been continued for nine years are given. "The use of both nitrogen and phosphorus, either alone or in combination, has given very satisfactory results. Phosphorus hastens maturity. The use of potash, either alone or in combination with the other elements, appears to be unnecessary in these soils. On thin upland the use of 200 to 300 lbs. of an equal mixture of cotton-seed meal and acid phosphate per acre, placed about 3 in. deep under the seed, should give very satisfactory results. On the more fertile soils the quantity of phosphorus may be increased to advantage.

"After leguminous crops phosphate alone at the rate of from 200 to 400 lbs. per acre can be used to profit. Where leguminous crops are to be grown, from 300 to 400 lbs. of rock floats can be used to advantage. Where rock floats is mixed with manure the results are most satisfactory."

Variety tests at the Delta substation, reported by G. B. Walker, showed Express variety to be the most valuable producer.

Express cotton, E. C. EWING (*Mississippi Sta. Circ.*, 1915, Jan., pp. 8, figs. 2).—This bulletin gives the origin, history, and various characteristics of this variety of cotton. It is noted as being a rather vigorous grower, but not a storm-proof variety, and rather free from fungus diseases. One of the most distinctive characteristics is its earliness. The length of staple is given as about $1\frac{3}{8}$ in., and the percentage of lint as about 28.

Cowpea culture, O. O. CHURCHILL (*Oklahoma Sta. Bul. 105 (1914), pp. 3-22, figs. 8*).—This bulletin describes methods of production suitable to Oklahoma conditions and reports results of variety tests for the years 1911, 1912, and 1913, in which the yields of grain ranged from 0 to 10.14 bu. per acre. Notes give characteristics of several varieties during the growing period of 1913. It is stated that the Speckled Crowder, Whippoorwill, and New Era varieties are considered the best for general purposes in Oklahoma.

Kaoliang, a new dry land crop, A. N. HUME and M. CHAMPLIN (*South Dakota Sta. Bul. 156 (1914), pp. 115-127, figs. 5*).—A brief history and description of the plant is given. Results of tests show that at "Highmore the average yield for the five years from 1909 to 1913, inclusive, has been 16.5 bu. of S. D. 289 and 13.8 bu. of S. D. 290. The highest yield of S. D. 289 was 19.2 bu., in 1910, and the lowest was 10.3 bu., in 1911. The average yield of Minnesota No. 13 yellow dent corn for this same period is 12.6 bu., showing that the climatic conditions were decidedly severe. At Cottonwood in 1912 kaoliang yielded an average of 23.7 bu. per acre as compared with 22.5 bu. per acre for Minnesota No. 13 corn. In 1913 the season was so severe at Cottonwood that both kaoliang and corn failed to produce grain, but the kaoliang produced 440 lbs. of dry fodder per acre to 260 lbs. for the corn. In another test kaoliang yielded 2 bu. of grain and 766 lbs. of dry fodder, whereas corn yielded no grain and 687 lbs. of fodder, thus proving its value in an extremely severe season."

Methods of production suited to South Dakota conditions are described.

Variation and correlation of oats (*Avena sativa*).—I, **Studies showing the effect of seasonal changes on biometrical constants**, H. H. LOVE and C. E. LEIGHTY (*New York Cornell Sta. Mem. 3 (1914), pp. 79, figs. 6*).—This bulletin describes in detail and gives the results of studies carried out by the station in cooperation with this Department to discover what characters, if any, may be used as a basis for selection and the status of correlation of characters of the oat plant. The variety Sixty Day was used.

Data were gathered during 1908 to 1912, inclusive, and indicate, in regard to the relation of the correlation factors and oat production, that "the growth factors influence the developing plants in such a way that tall plants and high yield of grain are found together. . . . It is also interesting and important to note that as the plants tend to increase in height, the number of culms also increases. At the same time it is shown also that the average yield per culm increases as the height of plant increases. This shows the possibility of obtaining plants with many culms that may be high in production, which is rather important, since it is sometimes thought that the average yield of culm would tend to decrease as the number of culms on the plant increased.

"Another important fact brought out by this study is the relation between average weight of kernels and height of plant, and average weight of kernels and total yield. This has an important bearing on the practice of seeding oats. . . . One of the writers has sown hand-picked seed of a number of varieties of oats, and found that in every case the larger yield was obtained from the heavy seed. In another test with oats, in which large and small kernels from the same head were compared, the large seed gave a greater yield."

From the data presented the following conclusions have been drawn:

"Environmental conditions such as exist in different years cause changes in the means. Conditions that generally result in reduction of plant yield also result in reduction of height, number of kernels, and number of culms, but in increase in size of kernels. Yield is reduced by decrease in number of kernels

produced, rather than by decrease in their size. Variability decreases with decrease in the means.

"Correlations are more or less responsive to environmental conditions, and may be divided into fluctuating and stable, according to their behavior under differing environments. There are high, positive, and fairly stable correlations between average height of plant and (a) total and average yield, (b) total and average number of kernels produced, (c) average number of spikelets per culm; the correlations between average height of plant and (d) average weight of kernels, (e) number of culms, are fluctuating, being high or low on occasion. There are high, positive, and stable correlations between total yield and (a) culm yield, (b) total and average kernel production, (c) spikelet production, (d) culm production.

"The average kernel weight is not correlated closely and consistently with any other character here considered, except average culm yield, with which the correlation is fairly high and fairly consistent. The average number of spikelets per culm per plant is correlated (a) fairly highly with the average number of kernels per spikelet; (b) apparently very highly with number of kernels per culm; (c) very highly and stably with average height of plant and total yield; and (d) in a fluctuating manner with kernel weight. The correlations between number of culms per plant and (a) height, (b) culm yield, (c) number of kernels, are fluctuating, varying greatly from high to low; between number of culms per plant and (d) total yield they are high, positive, and stable; between number of culms per plant and (e) average kernel weight they are fairly stable and always low."

A bibliography of cited literature is appended.

Variation and correlation of oats (*Avena sativa*).—II, Effect of differences in environment, varieties, and methods on biometrical constants, C. E. LEIGHTY (*New York Cornell Sta. Mem. 4* (1914), pp. 71-216).—The characters of oats dealt with in these studies are height of culm and average height of plant, average length of head per plant, total weight of plant, total weight of culm, average weight of culm per plant, number of kernels, number of spikelets, number of kernels per spikelet of plant, total weight of straw for the entire plant, total weight of straw per culm, average weight of straw per culm of plant, average weight of kernels per plant, diameter of straw, breaking strength of straw, total yield of plant and culm, and average yield of culm per plant.

"The study has been pursued with several purposes in view. One purpose has been to determine the averages, the amounts of variation, and the correlations that exist in various characters of oats. Another has been to determine effects on these characters of various environmental influences. Under the latter head data on the question of methods to be pursued in biometrical work with cereals have been adduced. Correlation has been carefully considered. This was deemed advisable because of the increasing use of, and attention given to, such studies. The correlations taken up have been principally of yield and average weight of kernels with various other characters. . . .

"The first division of this study is a comparison of biometrical constants determined for oat plants and for the culms of the same plants. From the results obtained it may be concluded that, for statistical work with oats, practically the same means and correlation coefficients will be obtained whether plants are used as units or the culms of the same plants are used as units, but that these constants will be slightly greater for the latter method. The standard deviations and coefficients of variability will also be greater when culms are the units. The biometrical results obtained by the several investigators,

whether they worked with culms or with plants, are, however, comparable, with slight reservation, as far as this factor affects the results.

"The second division of this study is a biometrical comparison of varieties of oats. In this study considerable difference is shown in average yield of culm per plant. This is due to the larger kernels produced by certain varieties, since the number of kernels and of spikelets are about the same for the different varieties. There are varietal differences in the height of culm. The average number of kernels per spikelet is greatest in the Sixty Day and smallest in the Early Champion variety. The proportion of straw to grain differs in the different varieties. Considerable difference is found in the amount of variability of different characters of the varieties. The greatest variability, in all characters but one, is found in the Welcome variety, while each of the others is least variable in one or more characters. The coefficients of correlation are usually fairly close together for the different varieties, but some differences occur that may be due to varietal causes.

"The third division of this study is a comparison of biometrical constants determined for oat plants grown in hills and in drills. Regarding all characters here studied, the means are greater for plants grown in hills than for plants grown in drills. The least difference in the means occurs in the cases of average height of plant and average weight of kernels per plant. There is greater variability in average yield of culm per plant and average weight of straw in plants grown in hills, but much less variability for plants so grown in average height and average weight of kernels. The variability in number of kernels and number of spikelets is slightly greater for the plants grown in hills. Rather large differences occur in the same variety between the coefficients of correlation determined for the plants grown in the two ways. Whenever large differences in the coefficients of correlation occur, those for the plants grown in hills are always the smaller in amount. The differences due only to the growing condition may amount to more than any varietal differences observed in this work. The constants, then, obtained by different investigators are comparable only in so far as the conditions of growth are comparable.

"The fourth division of this study deals with the effect of different degrees of crowding on biometrical constants of oats. Oat plants grown in very crowded conditions produce but one culm to a plant, but, as more room is given, more than one culm are produced by many plants. The development of plants in most characters is greater in less crowded than in more crowded conditions. Variability decreases with increase in crowding for yield, number of kernels, number of spikelets, and breaking strength of straw; but for height the least variability occurs when crowding is least. In every case when significant differences exist in the correlations between characters in plants grown under different conditions of crowding, there is an increase in correlations produced by more crowded conditions, but there is sometimes a decrease beyond a certain degree of crowding. It has been shown that environmental conditions may influence the degree of correlation of certain characters to a marked extent. Such conditions of environment may make of no significance the so-called varietal and other differences obtained by several investigators."

A bibliography of cited literature is appended.

Irish potatoes, J. C. C. PRICE (*Alabama Col. Sta. Bul. 183 (1915), pp. 3-16, figs. 2*).—This bulletin describes cultural methods that may be used in Alabama, touching upon soil, varieties, fertilizers, culture, insects and diseases, harvesting, and shipping and storing, both for the early crop and for the fall crop, and also gives results of fertilizer experiments for the years 1911, 1912, and 1913, and of variety tests for these years and 1910. The best yield was ob-

tained with Bliss Triumph in 1912, namely 304 bu. per acre. Irish Cobbler yielded 299.37 bu. per acre in 1911.

In the fertilizer tests the plat receiving a complete fertilizer application in which dried blood was used as a source of nitrogen produced the largest yield, with cotton-seed meal plus acid phosphate, second. Of the single fertilizers the highest yield was obtained with cotton-seed meal, with dried blood second.

Selection and preparation of seed potatoes, size of seed piece and bud variation. A. N. HUME and I. S. OAKLAND (*South Dakota Sta. Bul. 155 (1914)*, pp. 100-111, figs. 4).—This continues the report of work previously noted (E. S. R., 29, p. 37).

A comparison of yields from seed pieces taken from selected tubers and from culls of two varieties showed in an average of nine cases an increased yield of 5.53 bu. per acre in favor of the selected seed, the average total yield per acre being 114.2 bu. In this test the tubers were cut into quarters, so that the culls represented smaller seed pieces. Early Ohio selected tubers averaged 6.15 oz. and the culls 1.88 oz. in weight. Carmen No. 3 selected tubers averaged 8.4 oz. and the culls 2.08 oz.

A test of the influence of size of seed piece on yield consisted in planting small, medium, and large seed pieces taken from the same tuber.

It is noted that from Early Ohio seed, the average yield from seed pieces of 0.35 oz. was 183.8 bu. per acre, from pieces weighing 1.4 oz., 272.53 bu., and from seed pieces weighing 2.66 oz., 298.59 bu. With Carmen No. 3 seed, the use of seed pieces of 0.35 oz. weight produced an average of 165.66 bu., those of 2.1 oz. weight produced 270.9 bu., and those weighing 4.4 oz. produced 298.23 bu.

As a result of a study of the influence of culls and selected seed upon type and size of progeny it is stated that "under the conditions of this experiment, the use of sizeable seed produced a greater proportion of potatoes of desirable size than the use of culls. The type of potatoes produced from culls used as seed is measurably smaller in the first generation than those produced from selected seed tubers. The results of this experiment furnish quantitative evidence that the use of 'culls' for seed causes potatoes to 'run out.'"

"Not only is the type of tubers produced from selected seed larger than from culls, but also the average weight of tubers produced is greater."

A table shows the comparison of frequencies and weights of tubers produced from culls and from selected seed tubers.

Sudan grass. R. E. KAPER (*Oklahoma Sta. Bul. 103 (1915)*, pp. 3-14, figs. 3).—This bulletin describes methods of production of Sudan grass suitable for Oklahoma conditions, together with some data on cultural tests. The results of planting on eleven different dates, between April 15 and July 6, 1914, show early May, from the sixth to the fourteenth, to be the most favorable time to plant Sudan grass for hay.

"It will be observed from the data given that the 6-in. rows gave larger yields than the 21-in., and the 42-in. rows gave by far the largest yields. The increase of the 6-in. rows over the 21-in. rows was due to the fact that the crab grass and other weeds grew up on the 21-in. plat and the rows were not of sufficient width to permit the use of the cultivator to keep them down, while the 6-in. rows were close enough together to smother out the majority of the weeds. The 6-in. and 21-in. plats did not come on again after the first cutting was made on account of lack of moisture. The plats of 42-in. rows made two cuttings, which also helps account for their larger yields."

In testing the proper time to cut Sudan grass for seed production larger yields were obtained by cutting on July 28 than on July 14, 17, or 22, the largest yield

being 350 lbs. per acre. Wide spacing between rows, namely, 42 in., produced larger yields of seed than 6-in. spacing.

A table reports analyses of Sudan grass and other forage crops generally grown in Oklahoma. The uses and value of the Sudan grass crop for soiling and silage, pasture, catch crop, rotation crop, and forage are briefly noted.

The commercial production of sugar-beet seed in Utah, F. S. HARRIS (*Utah Sta. Bul. 136 (1915), pp. 47-58, figs. 6*).—In describing the methods for the production of sugar-beet seed in Utah the topics covered include getting the "mother seed," siloing, planting, caring for the crop, harvesting and threshing, cleaning, yield, and cost. Data from crops grown in 1912, 1913, and 1914 show that beets from home-grown seed were higher in sugar content than the beets from imported seed, although the yield from the imported seed was somewhat higher. The average weight of seed produced by mother beets for the years 1905 to 1913, inclusive, ranged from 263.7 to 722.6 gm. per beet.

In testing different methods of preserving mother beets during the winter in the rows where they grew it was found that covering with manure 6 in. deep was much more satisfactory than covering with 8 in. of straw or with 8 in. of straw and 4 in. of soil, or covering by running a plow along the row. In the latter case none of the beets survived the winter, while from the manure-covered row 197 beets lived and produced 26 lbs. of seed.

The average seed production at the station for 1912, 1913, and 1914 is given as 1,190, 1,354, and 1,571 lbs. per acre, respectively, and the estimated cost of production as \$95 per acre.

Sweet potato growing in the cotton belt, H. C. THOMPSON (*U. S. Dept. Agr., Office Sec. Spec. [Circ.], 1915, Mar. 9, pp. 8*).—Brief notes on cultural methods and uses are given.

Types and varieties of Maryland tobacco, W. W. GARNER and D. E. BROWN (*Maryland Sta. Bul. 188 (1914), pp. 135-152, figs. 4*).—This bulletin describes the characteristics of Maryland types of tobacco, together with some commercial qualities, including the varieties Maryland Broadleaf, Maryland Narrowleaf, Maryland-Connecticut Broadleaf, Maryland-Burley Broadleaf, and Maryland Mammoth. Instructions for producing and saving the seed under bag and for the selection of seed plants are given.

Data show the results of variety tests and the proportion of leaf to stalk in different varieties, conducted in cooperation between the station and this Department. "The results of these tests indicate that the Maryland-Connecticut and the Maryland-Burley are desirable types for growing on the lighter soils, which produce tobacco of fine quality, while the Mammoth gives promise of proving at least equal to the best varieties on these light soils and decidedly superior to all other varieties on the heavier, more fertile tobacco soils on which other varieties produce tobacco of comparatively poor quality." The Maryland-Burley Broadleaf and Maryland Mammoth produced a considerably lower proportion of stalk than the other three varieties.

The quality of grass and rape seed found in Maryland markets in 1913, C. P. SMITH (*Maryland Sta. Bul. 189 (1915), pp. 153-180*).—This bulletin completes the published results (*E. S. R., 31, p. 438*) of 1913 inspection work amongst the Maryland field seed vendors and also presents the text of the Maryland seed law of 1914. The seeds covered by the work in this bulletin are timothy, blue grass, German millet, orchard grass, redtop, and Dwarf Essex rape.

[Seed inspections], A. ATKINSON and B. W. WHITLOCK (*Montana Sta. Bul. 101 (1914), pp. 165-176, fig. 1*).—The first annual report of the State Grain Laboratory gives results of germination and purity determinations for 2,266 samples of seeds. The largest number of varieties of weed seeds, namely, 60,

was found in 549 samples of alfalfa; 42 varieties were found in 99 samples of timothy; 31 in 58 samples of red clover; and 31 in 260 samples of oats, and smaller numbers in the remaining 18 kinds of seed examined.

Seed tests made at the station during 1914, M. T. MUNN (*New York State Sta. Bul. 394 (1915), pp. 27*).—This bulletin gives results of analyses of 303 official samples of seed and 1,155 samples sent in by correspondents in 1914, and discusses the method of analysis and requirements of the seed law and its significance to New York farmers.

Of the official samples 10.9 per cent showed violations of the law, these being mainly alsike clover samples contaminated in the field with other crop seeds. However, "the present seed law affords only a partial protection to the purchasers of seed, since it does not require a reasonable freedom from dodder or other noxious weeds or from inert matter."

Analysis of the correspondents' samples "indicate that the number of kinds of weed seeds found in crop seeds for sale in this State is increasing."

Purity of farm seeds in 1914, F. H. HALL (*New York State Sta. Bul. 394 (1915), popular ed., pp. 4, fig. 1*).—A popular edition of the above.

Agricultural seed, G. P. BURNS (*Vermont Sta. Bul. 183 (1914), pp. 269-294*).—This bulletin gives the text of the Vermont seed inspection law and shows in tabular form the results of examining 234 official samples and about 100 voluntary samples. Alfalfa, alsike clover, corn, millets, red clover, redtop, and timothy seed as sold in Vermont was compared with the United States standard, a large part of the samples other than redtop being equal to or better than the standard. Eighty-five per cent of the seed other than redtop was of standard quality as regards purity and 88 per cent as regards viability.

Suppression of weeds among pineapples by arsenite of soda spray, F. G. KRAUSS (*Hawaii Sta. Press Bul. 48 (1915), pp. 8, figs. 2*).—This describes methods and apparatus used in successfully destroying weeds on pineapple plantations by the use of arsenite of soda spray, the most successful solution being 5 lbs. of white arsenic, 5 lbs. of carbonate of soda boiled in 10 gal. of water, and additional water to make 100 gal. The total cost of the spraying is given as \$2.30 per acre.

HORTICULTURE.

[Horticultural investigations in Guam], J. B. THOMPSON (*Guam Sta. Rpt. 1914, pp. 9-14, pls. 2*).—Notes are given on the culture and adaptability of many of the common vegetables under conditions in Guam. Thus far the ordinary commercial varieties of tomatoes have failed to grow. Results during the past season with the Texas Bell, a strain of the cherry tomato, indicate that this variety will succeed and that a fixed type of tomatoes may be developed for Guam by selecting and breeding from the largest fruited plants of Texas Bell.

The propagation of mangoes at the station (E. S. R., 31, p. 441) was continued during the year, and a limited number of inarched plants have been distributed to planters. It was demonstrated that by using proper precautions to prevent undue evaporation large mango trees may be successfully transplanted.

Report of the acting horticulturist, C. J. HUNN (*Hawaii Sta. Rpt. 1914, pp. 29-35, pls. 2*).—In a previous report (E. S. R., 30, p. 841) on the work of breeding papayas with the view of eliminating male trees, one type was secured which yielded 94 per cent fruit-bearing trees out of 343 F₂ trees. Additional data show that out of 454 of these F₂ trees which has fruited 95.37 per cent were fruit bearing, thus indicating that with the continuation of the breeding

work the staminate type will be eliminated. During the course of breeding work an elongated fruit has increased in percentage which gives promise of the ultimate development of a pure strain of uniformly cylindrical fruits of good quality. The future breeding work is to be confined to the elongata type.

Attention was also called in the previous bulletin on papayas to authenticated instances in which male papayas had been changed to fruiting trees by cutting the tops off the male trees. Such an experiment was conducted at the station by V. S. Holt during the past summer, in which the tops were removed from 22 sterile staminate trees selected from different varieties. Two of these trees, which had been selected from the above-noted type which yielded 95.37 per cent fruit-bearing trees, did become fruit-bearing trees when the top grew out again. In lieu of more definite knowledge this phenomenon is attributed to the preponderant tendency to fruit bearing in the type from which the two trees were selected.

Data have been accumulated showing the various types of trees in the mango and avocado orchards. The average age and time of bearing of mango seedlings was 6 years 3 months; budded mangoes, 3 years 8 months; inarched mangoes, 2 years 10 months; avocado seedlings, 7 years; and budded avocados, 2 years 11 months.

Heavy paper bags have been used with success in protecting ripening fruit from the attacks of the Mediterranean fruit fly. The individual fruits ripen more uniformly, but lack the color of those exposed to the sun. Several varieties of the Indian mango have been found to be practically immune to the attacks of the fruit fly.

The work of breeding ornamental hibiscus plants (E. S. R., 30, p. 838) has been continued. A number of new varieties has been secured, one of which, a yellow variety, is described. A description is given of a spineless cactus which was collected by the station several years ago in Honolulu and which is believed to be worthy of attention as an ornamental hedge and as a fodder plant. The wampee (*Clausena lansium*), a tree whose edible berries are highly esteemed by the Chinese, is also described. About a dozen of these trees are in bearing in Honolulu.

A further report is given on two lots of pineapple seedlings which were secured from a single fruit in each case (E. S. R., 30, p. 838). The plants continue to show a great variation in height, spread of foliage, color, and other characters. A number of these plants give promise of developing into superior plants, and the best of the seedlings are to be grown under field conditions to determine the character of the fruit.

Report of the superintendent of the rubber substation, W. A. ANDERSON (*Hawaii Sta. Rpt. 1914, pp. 51-56*).—An experiment was started in 1912 to determine the feasibility of transmitting high yielding properties of individual Ceara rubber trees through cuttings. Cuttings of good yielding trees planted in February, 1912, and grown under cultivation with companion crops of broom corn and roselle were tapped with a single cut in January, 1914. The new growth on these trees, 1 ft. above the original cutting, averaged 10.8 in. in circumference. They yielded 16 oz. of washed rubber from one tapping of one cut per tree. This yield compared favorably with the average reported from 6-year-old unselected trees, tapped in 1912. The yield from the different trees was more uniform than on the plantations as a whole. The results thus far secured indicate that propagation by cuttings will assure more desirable latex-yielding qualities than propagation by seedlings.

The work on roselle as a companion crop with rubber shows that large yields can be obtained. To be profitable, however, the fresh fruit should sell for from 3 to 4 cts. a pound, whereas the highest price now paid for drying purposes in

a limited market is at the rate of 3½ cts. per pound. Precautions must be used against cutworms and some means of artificially drying the fruit must be provided. Under present conditions the fruit can be seeded most economically as it is picked. It has been found possible to continue some of the plants for a second season's crop.

Fertilizer experiments conducted with a thousand rubber trees, in which nitrogen, phosphoric acid, and potash were used both alone and in combination, are reported. The best results, both in yield of latex and growth of trees, were obtained by using superphosphate and potassium sulphate without any nitrogen. At the same time the results are not sufficiently pronounced to indicate that fertilizers can be used with profit on rubber trees in Nahiku, the district where the tests were made.

The home garden in the South, H. C. THOMPSON (*U. S. Dept. Agr., Farmers' Bul. 647 (1915), pp. 28, figs. 8*).—This publication, which has been prepared with special reference for use in the South, gives suggestions as to the location, plan, and arrangement of the garden, the soil and its preparation, manures and fertilizers, the seeds and plants to use, together with brief descriptions of the methods of handling the more important vegetables. Suggestions are also given relative to varieties suitable for securing a continuous supply of vegetables throughout the year.

Alaska's pomological resources and outlook, C. C. GEORGESON (*Proc. Amer. Pomol. Soc., 1913, pp. 79-82*).—A short account relative to the adaptability of various orchard and small fruits to Alaskan conditions.

The present status of Canadian pomology, W. T. MACOUN (*Proc. Amer. Pomol. Soc., 1913, pp. 64-79, pl. 1*).—An account of the orchard industry in Canada in which consideration is given to the kinds of fruit grown in the different districts, fruit breeding, methods of culture and marketing, and government aid to fruit growers. Data are given showing the number of bearing and nonbearing fruit trees for each Province in 1910, exports of various fruits from Canada in 1912-13, and lists of the principal varieties of fruits grown, including a list of fruits of Canadian origin.

Fruit in the North, D. W. BUCHANAN (*Proc. Amer. Pomol. Soc., 1913, pp. 55-58*).—A short account of the adaptability of various deciduous fruits to conditions in Manitoba.

[Report of the] division of horticulture (*Washington Sta. Bul. 118 (1914), pp. 24-26*).—The orchard pollination study, which is being conducted at Pullman and in several private orchards, indicates that with one or two exceptions the varieties of apples blossom so nearly at the same date that interpollination can take place between any of the common commercial apples. The indications are that while several of the apple varieties may under certain circumstances be partially or entirely self-sterile, these same varieties may be considered fairly successful when grown in solid blocks in the thickly planted orchard sections.

A study of the keeping quality of fruit, especially apples, indicates thus far that fruit developed on trees that received an excess of water have their keeping qualities greatly impaired. The tissue is soft, easily broken, and goes down quickly in storage. Fruit developed on trees receiving approximately the correct supply of water for development of medium-sized firm fruit for the variety have the maximum keeping quality. Fruit developed on trees receiving less water than that necessary for the development of medium-sized fruit is inferior in quality and appearance and tends to shrivel before decaying.

Winter work in orchards, M. P. SOMES (*Missouri Fruit Sta. Circ. 7 (1914), pp. 3*).—This circular calls attention to work, such as pruning, spraying for

scale, worming for borers, etc., that may be carried on during the winter period of idleness.

Does spraying pay? M. P. SOMES (*Missouri Fruit Sta. Circ.* 8 (1914), pp. 3).—In this circular the author presents data taken from experiments made by the station to show that it pays to spray even single trees. Attention is called to the fact that spraying as it is too often done does not pay, and brief general suggestions are given relative to proper methods of spraying.

[Orchard heating], A. J. COOK (*Bien. Rpt. Cal. State Com. Hort.*, 6 (1913-14), p. 8).—In a brief summary dealing with observations of the freeze in the California citrus region in January, 1913, the author concludes that orchard heating is indispensable, and that a good heating system with sufficient oil and help available on call will protect against the lowest temperature ever yet known in the citrus belt.

Apple growing in California, G. P. WELDON (*Sacramento: State Com. Hort.*, 1914, pp. 124, figs. 58).—A practical treatise designed to cover the more important phases of apple culture with special reference to California conditions. The introductory chapter gives the statistics of the apple industry in that State.

"Iowa 403," a new seedling apple, S. A. BEACH (*Iowa Sta. Circ.* 18 (1914), pp. 3).—This circular gives the history as far as known and description of one of the promising seedling apples originated at the station which has been named "Iowa 403." The apple as here described is dark red, attractive when well-colored, and desirable for either cooking or dessert uses. The test thus far indicates that the tree is a reliable cropper under adverse climatic conditions. The variety is now offered for distribution to nurseries.

The technical description of apples, J. K. SHAW (*Massachusetts Sta. Bul.* 159 (1914), pp. 73-90, pls. 4, figs. 3).—In this bulletin the author has compiled in a definite and systematic manner various methods and terms used in the systematic and commercial description of apples, both trees and fruit. The bulletin is intended for the use of students and investigators in connection with a text-book or reference work on systematic pomology. A number of reference works are listed.

The varieties of plums derived from native American species, W. F. WIGHT (*U. S. Dept. Agr. Bul.* 172 (1915), pp. 44).—This bulletin comprises a record of American varieties of plums including hybrid forms. The record as a whole shows the species to which the variety belongs, its geographic origin, time of introduction, and the introducer. Plant material has been examined whenever procurable. References are given to persons, institutions, and localities furnishing material as well as to other sources of information, much of which was found in *The Plums of New York* (E. S. R., 27, p. 40).

Plum culture in Ontario, F. M. CLEMENT (*Ontario Dept. Agr. Bul.* 226 (1914), pp. 32, figs. 12).—This bulletin discusses the present status of the plum industry in Canada as a whole and the cultural methods of the most successful growers in Ontario, describes the more important commercial varieties, and offers suggestions relative to future development.

The native persimmon (*Diospyros virginiana*), W. F. FLETCHER (*Proc. Amer. Pomol. Soc.*, 1913, pp. 48-50).—A short account of the native persimmon with reference to its history, characteristics, distribution, propagation, and culinary uses.

Studies on native fruits.—I, Grapes, musts, wines, ciders, and vinegars, J. PUIG Y NATTINO (*Min. Indus. [Uruguay], Insp. Nac. Ganadería y Agr. Bol.* 10 (1914), pp. 62, figs. 9).—This is the first of a series of studies on the fruits and fruit products of Uruguay. The present bulletin contains analytical data

showing the composition of a large number of varieties of grapes, with special reference to the density of the must and the content of sugar, acid, and ash. Analyses are also given of wines, vinegars, and ciders derived from the grapes, together with data showing the average size of fruit of each variety and the proportion of stems, skins, and seeds.

Studies on native fruits.—II, Peaches, pears, and plums, J. PUIG Y NATINO (*Min. Indus. [Uruguay], Insp. Nac. Ganaderia y Agr. Bol. 13 (1914), pp. 77, pls. 86, figs. 10*).—In continuation of the above work data are here presented for different varieties of peaches, pears, and plums relative to their sugar, acid, protein, and ash content, the average weight of fruit, and the proportion of waste material. Outline drawings are given showing the general shape of many of the varieties.

A basis for the future classification of the mango, F. W. POPENOE (*Proc. Amer. Pomol. Soc., 1913, pp. 41-47, pls. 2, fig. 1*).—In this paper the author presents suggestions relative to the description and classification of mangoes, together with a bibliography of literature dealing with mangoes.

The handling of Porto Rican oranges, grapefruit, and pineapples, C. W. MANN (*Porto Rico Bd. Agr. Expt. Sta. Bul. 7 (1914), pp. 59, figs. 24*).—During the shipping season of 1913-14 the losses from decay in cargoes of oranges, grapefruit, and pineapples shipped from Porto Rico to New York were so severe that the U. S. Department of Agriculture conducted an investigation in behalf of Porto Rican growers to determine the causes of this decay. Some data are presented showing the percentage of decay found in several lots of grapefruit and oranges, and an account is given of an inspection made in Porto Rico relative to methods of handling the fruit in groves and packing houses and in transportation to the steamers, together with recommendations for improving these practices as well as improving the methods of handling fruit during transportation and in New York. The results of the investigation as a whole indicate that as with the work in California and Florida (*E. S. R., 20, p. 43; 30, p. 841*) there is a close relation between the occurrence of decay and the character of the methods employed in picking, packing, and transporting fruit.

Statistical data covering several years are given showing the growth of the citrus and pineapple industries in Porto Rico.

[Experiments on the applicability of cold storage to various tropical fruits], E. V. WILCOX (*Hawaii Sta. Rpt. 1914, p. 23*).—A brief statement of progress. The work has been noted more in detail from another source (*E. S. R., 32, p. 439*).

Tropical fruits in the Philippines, P. J. WESTER (*Proc. Amer. Pomol. Soc., 1913, pp. 88-91*).—A short account of the more important fruits and the present status of fruit growing in the Philippines.

[Cacao investigations at River Estate], P. CARMODY (*Bul. Dept. Agr. Trinidad and Tobago, 13 (1914), No. 84, pp. 312-319*).—Data are given showing the comparative yields for a 4-year period of 100 individual cacao trees. The results, as a whole, indicate an inherent productivity for individual trees. Data are also given showing the yields on the various cacao manurial plats for the 4-year period 1910-11 to 1913-14.

Cocoa, C. J. J. VAN HALL (*London: Macmillan and Co., Ltd., 1914, pp. XVI+515, figs. 140*).—A handbook on cacao in which the successive chapters discuss the history of the cocoa industry; geographical distribution and climatic conditions; the chemistry of cacao and cacao soils; the botanical characteristics of the cacao plant; varieties of cacao; the cultivation of cacao; fermentation, washing, and drying; diseases and enemies; cacao growing countries; commerce; and notes on the cocoa and chocolate industry.

Report of the coffee testing gardens at Bangelan, T. WURTH (*Jaarb. Dept. Landb., Nijr. en Handel Nederland, Indië, 1913, pp. 43-57, pls. 3*).—A progress report on cultural and selection studies with various kinds of coffee.

Data secured with reference to the sterility or self-fertility of coffee blooms indicate that a certain amount of fruit was set when the blossoms were protected from outside pollination. Tests are to be conducted further to determine whether the seed from close pollinated fruit is viable. Data are given on the yields secured in 1911, 1912, and 1913 from seedling plants selected from various mother trees. A test which has been conducted for three seasons to determine whether Robusta and Quillon coffees can be grown better as single-stem plants or as multiple-stem plants has thus far shown very little difference in yield. In some topping experiments with these two varieties the trees were headed back at different heights ranging from 6 to 12 ft., and the results indicate that the higher the trees are topped the greater the yield of coffee. For the three years of tests untopped trees gave somewhat better yields than topped trees. In a test of the viability of coffee seed placed in storage, samples of Robusta coffee seed which had been stored in dampened powdered charcoal for a period of five months give a total germination of 67 per cent.

[**The influence of fruit flies on the quality of coffee**], E. V. WILCOX (*Hawaii Sta. Rpt. 1914, p. 22*).—Analyses were made of samples of coffee from coffee cherries uninfested with fruit fly, badly infested with fruit fly, and also from half-ripe cherries taken four or five days before they would be completely ripe. No chemical differences in the composition were noted in the different samples. Coffee was prepared for drinking from all the samples by three different methods and was submitted to several persons for their opinion as to the flavor and other qualities of the different samples. The various reports agreed that the sample from the infested fruit was slightly insipid and poor in quality, while that from the fruit not quite ripe was best in quality. The deterioration in quality in ripe coffee berries is attributed to the fermentation of the whole cherry which rapidly develops a putrefactive odor.

A further test was made to determine whether infestation with the fruit fly might cause a loss of weight in coffee. It was found that the weight of berries from infested coffee cherries immediately after pulping was 5 per cent less than that of berries from uninfested fruit. When the coffee came to a constant weight and was considered dry, however, the weights of the two lots were the same. Hence it appears that little or no loss in the weight of the coffee berry is caused by infestation by the fruit fly.

The palms cultivated in the open air in the gardens of Italy, G. ROSTER (*Bul. R. Soc. Toscana Ort., 3. ser., 18 (1913), Nos. 2-3, pp. 36-46; 4, pp. 82-93, fig. 1; 5, pp. 107-113, pl. 1; 6, pp. 131-135, pl. 1; 7, pp. 153-158, pl. 1; 8, pp. 178-181; 9, pp. 194-200; 10, pp. 218-225, pl. 1; 12, pp. 265-269, pl. 1; 19 (1914), Nos. 1, pp. 13-17, pl. 1; 3, pp. 54-61, pl. 1; 5, pp. 110-113; 6, pp. 124-129, pl. 1; 7, pp. 150-155; 8, pp. 169-176; 9, pp. 191-193; 10, pp. 213-224, pl. 1; 11, pp. 239-244; 20 (1915), Nos. 1, pp. 12-19; 2, pp. 32-43*).—This comprises an enumeration of those species of palms which are cultivated in Italy under open garden conditions. A summary is given of the more important vegetative characters of the different species. Only those species are considered at length which have been observed growing in more than one locality.

The present status of the different varieties of walnuts, W. W. FITZGERALD (*Mo. Bul. Com. Hort. Cal., 3 (1914), No. 12, pp. 493-500, fig. 1*).—Notes are given on the varieties of walnuts grown in California with reference to their general characteristics, bearing habits, commercial value, blight resistance, etc.

The use of commercial fertilizers in growing carnations, H. B. DORNER, F. W. MUNCIE, and A. H. NEHRLING (*Illinois Sta. Bul. 176 (1914), pp. 365-386*,

figs. 3; Bul. 176, Abs. (1914), pp. 4).—The experiments here reported in detail were conducted to determine the feasibility of the complete or partial substitution of commercial fertilizers for manure as a source of plant food for carnations.

In the first experiment, extending over a period of three years, commercial fertilizers in various proportions and amounts were applied to different sections of benches in the greenhouse and the effects on the number and quality of the flowers noted. In the second experiment, extending over two years, the production of sections treated with manure was compared with that from sections treated with commercial fertilizers. A uniform soil was selected for all sections.

The results of the work as a whole lead to the conclusion that dried blood (or ammonium sulphate instead), acid phosphate, and potassium sulphate may safely be used in the culture of carnations. On the brown silt loam used in the experiments nitrogenous fertilizers have produced a consistent increase in production. Nitrogen may be regarded as the limiting element of growth. There are indications that the addition of acid phosphate to a nitrogenous fertilizer will cause a still further increase in production and an improvement in quality as well. The quality of flowers produced with commercial fertilizers as measured by various factors is equal to that of those grown with manure. The time of maximum crop production was independent of the kind of fertilizer used and its time of application. Injury from overfeeding results from the excessive use of potassium sulphate and dried blood. On the other hand, large quantities of acid phosphate seem to improve the quantity and quality of the flowers.

FORESTRY.

Fourth annual report of the state forester to the governor, 1914, F. A. ELLIOTT (*Ann. Rpt. State Forester Oreg., 4 (1914), pp. 63, figs. 10).*—A progress report on forest administration in Oregon. The introductory chapter briefly reviews the forest resources of the State. The succeeding chapters deal with forest taxation, organization of protective work, fire losses, improvement work, slash disposal, federal cooperation under the Weeks Law, compulsory patrol law, association and state patrols, recommendations for improving protective work, and financial statements.

Report of the forest branch of the department of lands for the year ending December 31, 1914 (*Brit. Columbia Rpt. Forest Branch Dept. Lands, 1914, pp. 63, pls. 6, figs. 3).*—A report on forest administration in British Columbia in which information is given relative to forest organization, forest revenues, timber sales and leases, forest reconnaissance, the lumbering industry, including export and import statistics, minor forest industries, railway permits, regeneration and yield studies, land classification, grazing, forest protection, etc.

Annual progress report upon state forest administration in South Australia for the year 1913–14, W. GILL (*Ann. Rpt. State Forest Admin. So. Aust., 1913–14, pp. 11, pls. 7).*—A brief progress report on state forest administration in South Australia, including a financial statement for the year ended June 30, 1914. Data are given showing the area of forest reserves and plantations, areas inclosed for planting operations, the year's planting and other forest operations, and revenues and expenditures, including a comparative statement for the past 37 years.

The utilization of chemical locality factors by forest plants, H. BAUER (*Forstw. Centbl., n. ser., 36 (1914), Nos. 11, pp. 549–578; 12, pp. 610–621).*—In this article the author reviews the knowledge relative to the utilization by plants of residual chemical soil nutrients and of supplementary fertilizers, with

special reference to his work and that of Ramann, dealing with the variation in time of nutrient assimilation among forest trees (E. S. R., 26, p. 443; 27, p. 630). Results of recent analytical studies of red alder and elm trees are presented in tabular form and discussed in connection with previous investigations.

A montane rain-forest.—A contribution to the physiological plant geography of Jamaica, F. SHREVE (*Carnegie Inst. Washington Pub.* 199 (1914), pp. 110, pls. 29, figs. 18).—In this work the author presents the results of a study of the general physiological plant geography, as well as investigations on transpiration and growth in typical rain-forest forms occurring in the Blue Mountains in Jamaica.

A conspectus of North American firs (exclusive of Mexico), W. H. LAMB (*Proc. Soc. Amer. Foresters*, 9 (1914), No. 4, pp. 528-538, figs. 15).—The purpose of this paper is so to define and illustrate the distinguishing characteristics of North American firs that the group may be easily distinguished by forest officers.

A bibliography of reference literature is appended.

Forest planting in Arizona and New Mexico, G. A. PEARSON (*Proc. Soc. Amer. Foresters*, 9 (1914), No. 4, pp. 457-478).—This article embraces the results at present available from the efforts toward solving the reforestation problem on the National Forests in the Southwest. The data here presented are based on general planting operations in the Southwest and intensive experiments at the Fort Valley Experiment Station and at the Fort Bayard Nursery.

Reforestation of brush fields in northern California, R. H. BOERKER (*Forestry Quart.*, 13 (1915), No. 1, pp. 15-24).—A descriptive account of reforestation operations conducted on the Lassen National Forest, northern California, including information relative to costs of reforestation.

Charcoal as a means of solving some nursery problems, G. A. RETAN (*Forestry Quart.*, 13 (1915), No. 1, pp. 25-30).—An experiment conducted in the nursery at the Pennsylvania State Forest Academy in the use of charcoal as a dressing for forest seed beds is described. Included in the experiment was a comparative test of charcoal and commercial fertilizer.

Beds treated with charcoal gave a larger germination percentage than untreated beds. A constant observation of the beds seemed to indicate that where the proportion of charcoal in the bed is large there is less "damping-off." Thus far no definite results have been secured with reference to the comparative value of charcoal and the commercial fertilizer.

Organization of forest fire control forces, C. DU BOIS (*Proc. Soc. Amer. Foresters*, 9 (1914), No. 4, pp. 512-521).—A discussion of methods of organizing and directing fire protective bodies.

Tables for determining profits in forestry, W. D. STERRETT and W. B. BARROWS (*Forestry Quart.*, 13 (1915), No. 1, pp. 12-14).—A table is here given and discussed which aims to show for quite a wide range of yields and stumpage prices what will be the net profit and corresponding compound interest rate on a number of different initial investments.

A practical system of logging cost accounting, S. B. DETWILER (*Forestry Quart.*, 13 (1915), No. 1, pp. 8-11).—A logging cost accounting system is described which was used by the author with satisfactory results and is believed to be adapted to nursery work and other lines of forestry.

DISEASES OF PLANTS.

Report of the experiment station for plant diseases, 1913, H. C. MÜLLER ET AL. (*Ber. Agr. Chem. Kontroll u. Vers. Stat. Pflanzenkrank. Prov. Sachsen*, 1913, pp. 63-73).—This contains brief notes of plant diseases as reported by

correspondents, and of investigations at the experiment station for the province of Saxony, referring to diseases of cereal, root, and tuber crops; also of tests made with fungicidal applications and apparatus for their employment.

A list of 1913 publications is also given.

Mycological notes, B. G. C. BOLLAND (*Agr. Jour. Egypt*, 3 (1913), No. 2, pp. 123-126).—Seed wheat soaked in copper sulphate solution of 0.5 to 10 per cent strength for periods varying from 1 to 30 minutes and germinated showed the increasingly injurious effects of concentrations greater than 0.5 per cent, and of exposure for longer periods than 10 minutes for the weakest solution and of 5 minutes or even 1 minute for higher concentrations.

A fruit spot on apples originating at Constantinople and examined at Alexandria was diagnosed as due to *Cylindrosporium pomi*.

Fungi causing disease in Surinam, J. KUIJPER (*Rec. Trav. Bot. Néerland.*, 11 (1914), No. 1, pp. 44-53, figs. 9).—Noting briefly *Cercospora coffeicola* spotting leaves and aborting grains in Coffea, *Leptosphaeria coffeicola* in brown leaf spots on coffee, *Mycosphaerella coffea* causing less leaf damage than formerly in the same plant, and *M. eriodendri*, described as a new species on young plants of *Eriodendron anfractuosum*, the author also mentions as saprophytic or more or less parasitic, *Sphaerotheca pannosa* on roses, *Phyllosticta theobromae* on cacao leaves, *P. coffeicola* as a secondary fungus in leaf spots on coffee, *Ascochyta atropa* on leaves of *Phaseolus mungo*, *Cercospora personata* on leaves of *Arachis hypogaea*, *C. rosicola* on roses imported from Europe, and *C. viticola* on leaves and fruits of grape.

A review of some Philippine plant diseases, C. F. BAKER (*Philippine Agr. and Forester*, 3 (1914), No. 7, pp. 157, 164).—The author briefly notes the occurrence, distribution, and in some instances the effect produced by fungi attacking a considerable number of cultivated plants in the Philippines.

A new North American Endophyllum, J. C. ARTHUR and F. D. FROMME (*Abs. in Science*, n. ser., 41 (1915), No. 1048, p. 172).—The authors describe a species of Endophyllum which is reported as occurring on species of Callirhoe, Sidalcea, and Althaea in Kansas, Nebraska, Colorado, and Wyoming. This is believed to be the first North American rust which is assigned to the genus Endophyllum, as shown by germination tests.

Studies in the genus Entorrhiza, C. FERDINANDSEN and Ö. WINGE (*Dansk Bot. Arkiv*, 2 (1914), No. 1, pp. 13, figs. 8).—According to the authors the genus Entorrhiza has been generally considered a near relative to the Ustilaginæ, although Brefeld (E. S. R., 27, p. 746) has advanced the opinion that it belongs to the Ascomycetes, the ascus form of which is unknown.

As a result of their studies they have come to the conclusion that Entorrhiza belongs in the neighborhood of the Ustilaginæ and may be considered as a primitive type of this group. All of the species are said to live in the soil and spread their spores by aid of the water, while the genuine Ustilaginæ are adapted to aerial life. Different species of Entorrhiza have been recognized which are parasitic on the roots of different species of Juncaceæ and Cyperaceæ.

A bibliography is given.

Effect of temperature on Glomerella, C. W. EDGEERTON (*Abs. in Science*, n. ser., 41 (1915), No. 1048, p. 174).—The author reports on the species or strains of the genus Glomerella which respond differently to different temperatures. One form, the one found on bean, *Colletotrichum lindemuthianum*, is very susceptible to high temperatures, growth ceasing at about a temperature of 31° C. (87.8° F.). This, it is believed, will explain why this form is not prevalent during the hot part of the summer or in warm climates. The different strains of Glomerella are said to fall into several classes in regard to the temperature

factor. Nearly 50 different cultures have been grown at temperatures ranging from 14 to 37° C.

Cultures of Uredineæ in 1912, 1913, and 1914, J. C. ARTHUR (*Mycologia*, 7 (1915), No. 2, pp. 61-89; *abs. in Science*, n. ser., 41 (1915), No. 1048, p. 172).—In continuance of previous investigations (E. S. R., 26, p. 645) the author has reported a large number of trials made, in which about 70 successful infections were produced, involving about 30 species. About half the successful cultures confirm previous work with the same species. A large number of the remainder extended knowledge regarding the species, some showing that what had been considered valid species may be reduced to synonymy, while a few cultures demonstrated the full life history of species never before cultured.

Disease in oat seedlings, E. VOGES (*Deut. Landw. Presse*, 41 (1914), Nos. 64, pp. 773, 774, figs. 3; 65, p. 782).—A study of nematodes in oats, also of a fungus (*Fusarium didymum*) found in the lower portions of the stem, is said to show that the former cause comparatively little damage to the crop, but that in the younger stages the latter may cause considerable injury when its presence is associated with bad soil conditions as regards texture, drainage, and balancing of fertilizers.

A test of Indiana varieties of wheat seed for fungus infection, G. N. HOFFER (*Proc. Ind. Acad. Sci.*, 1913, pp. 97, 98).—The author, reporting investigations of 34 varieties of seed wheat, states that 14 were free from fungi, 13 were infected with a *Fusarium*, 4 showed the presence of a *Macrosporium*, and 3 contained both these fungi.

Resistance of different varieties of wheat to rust, F. SCURTI and V. SICA (*Ann. R. Staz. Chim. Agr. Sper. Roma*, 2. ser., 7 (1914), pp. 33-56).—The authors, reporting on experiments continued for three years on varieties of wheat, state that the results thus far tend to confirm the conclusions announced by Comes (E. S. R., 30, p. 242) regarding a general relation between decrease of acidity in the cell sap and diminution of resistance to disease in plants which increases under cultivation.

Beet rust, J. ERIKSSON (*Rev. Gén. Bot.*, 25 bis (1914), pp. 247-258, figs. 2).—The author holds that *Uromyces betæ*, which causes beet rust (decreasing the sugar content of the root) may remain latent during the winter in the form of intracellular mycoplasma. Exclusion of seed originating in districts not known to be free from this disease is recommended.

Irish potato scab (*Oospora scabies*) as affected by fertilizers containing sulphates and chlorids, S. D. CONNER (*Proc. Ind. Acad. Sci.*, 1913, pp. 131-137, figs. 5).—Observations were made regarding the influence of certain fertilizing agents on scab.

It appeared that very little scab lived through the winter in a loamy soil, while in soils of more open texture, as peat or sand, the spores survived. Sulphur (but not sulphates) apparently has a marked influence in reducing scab, but chlorids increase the amount of that disease.

Report of pathologist, D. H. ROSE (*Missouri Fruit Sta. Rpt.* 1913-14, pp. 19-32, pls. 2).—A report is given of diseases of fruit trees and other plants, some of which have been subjected to definite study, while others are merely reported as having been observed.

Among the apple diseases studied are said to be a pimple canker or measles, several kinds of fruit spot, ring rot or blossom-end rot due to *Sphaeropsis malorum* after frost injury, curly leaf, cankers, bitter rot, etc. The study of the pimple canker of apples has shown that it is the same as that described in Arkansas Station Bulletin 112 (E. S. R., 29, p. 649). While numerous inoculations have been made, using three different organisms obtained in cultures, no positive results have been secured. Among the fruit spots studied are the

Jonathan spot, a red lenticel spot on several varieties of yellow and green apples, and a green sunken spot on the varieties Ben Davis and Shannon. From the first two spots a species of *Alternaria* has been uniformly separated, while from the third several fungi have been obtained which are to be investigated further. For the control of the bitter rot the author has found four sprayings with Bordeaux mixture necessary in case of severe infection.

Studies of peach diseases have shown that both the brown rot and scab may be controlled by the use of self-boiled lime sulphur.

A study of grape diseases has shown the presence of three diseases not previously reported from the station, a bitter ripe rot due to *Melanconium fuligineum*, necrosis or dead arm caused by *Cryptosporella viticola*, and a leaf spot due to a species of *Pestalozzia*.

The report concludes with an account of the cooperative work of the station with spraying, pruning, fertilization, and cultivation of fruit, principally apples, peaches, and strawberries.

Methods for controlling fungus diseases of the apple in New York State, D. REDDICK (*Conn. Pomol. Soc. Proc.*, 22 (1913), pp. 30-46).—This is a discussion of apple scab and its control, also brief mention of fruit spot, and blotch, bitter rot, rust, canker, collar rot, fire blight, Baldwin spot, and sun scald.

The cause of bitter pit: Its contributing factors, together with an investigation of susceptibility and immunity in apple varieties, D. McALPINE (*Prog. Rpt. Bitter Pit Invest. [Aust.]*, 2 (1912-13), pp. 224, pls. 62).—In continuation of a previous report (*E. S. R.*, 31, p. 244), the author discusses the causes of bitter pit and those factors which contribute to its development. From experimental evidence it is concluded that temperature and humidity induce bitter pit, and it was found that if apples are stored at a temperature of from 30 to 32° F. in dry air the development of bitter pit is retarded.

Respiration in apple leaves infected with *Gymnosporangium*, H. S. REED and C. H. CRABILL (*Abs. in Science, n. ser.*, 41 (1915), No. 1048, p. 180).—The authors found that diseased leaves uniformly produce more carbon dioxide than healthy leaves, various factors influencing the process.

Some effects of the brown rot fungus upon the composition of the peach, L. A. HAWKINS (*Amer. Jour. Bot.*, 2 (1915), No. 2, pp. 71-81; *Abs. in Science, n. ser.*, 41 (1915), No. 1048, p. 179).—The results are given of several series of experiments on the effect of the brown rot fungus on certain carbon compounds in the peach fruit.

In the experiments one-half of the peach was inoculated with a fungus while the other was kept sterile under the same moisture and temperature conditions. At the end of two or three weeks the different portions were analyzed and it was found that in the rotted portion the pentosan content was practically the same as in the sound half. The acid content was increased; the amount of alcohol-insoluble substance which reduces Fehling's solution when hydrolyzed with dilute hydrochloric acid was decreased; and the total sugar content was decreased, while the cane sugar practically disappeared.

[A banana disease in Hawaii], E. V. WILCOX (*Hawaii Sta. Rpt. 1914*, pp. 23, 24).—A brief account is given of a disease of banana that has been under observation in Hawaii for several years, and which has been confused with the Panama disease.

An examination of infested leaves, by a pathologist of the Hawaiian Sugar Planters' Station, showed the presence of a *Fusarium*, and at the border line between healthy and diseased material a bacterial organism was found. The disease has not been reproduced by inoculation, so the cause can not be definitely assigned. The most obvious symptom of the disease is the death and

decay of the terminal young leaves and the production of narrow, yellow, wrinkled leaves. The bunches of fruit are also much distorted.

Spraying with fungicides has not proved effective for the control of this disease, but if the diseased plants are cut out and destroyed by fire as soon as observed, it is held under control. The disease seems to be confined chiefly to the Chinese banana.

[Panama disease of banana] (*Jour. Jamaica Agr. Soc.*, 18 (1914), No. 11, pp. 450-455).—This is a report, with discussion, of a special committee on Panama disease discovered in 1912 and now appearing in new places on several estates in parts of Jamaica. It is said to be spread by planting suckers from diseased plants, also probably through dissemination of spores by laborers on tools, clothing, earth from diseased roots, etc.

The disease is said to be controllable, when found in any given spot, by the destruction of all the plants in the immediate neighborhood, and by drainage of the flood water therefrom into pits treated with lime. In Jamaica the disease has seldom reappeared after thorough treatment.

[Banana disease], S. F. ASHBY (*Jour. Jamaica Agr. Soc.*, 18 (1914), No. 11, p. 457).—This is a report by the government microbiologist on diseased banana material sent for examination from Glengoffe. Root galls are described as due to a *Heterodera*. A bud rot yielded two undetermined bacteria which closely resembled that causing the bud rot of coconut.

The extension of *Marsonia rosæ* in rose culture, CHIFFLOT (*Compt. Rend. Acad. Sci. [Paris]*, 159 (1914), No. 4, pp. 336-338).—Reporting observations on *M. rosæ* the author states that this fungus, formerly thought to be confined to the subcuticular portions of the leaves, may, in case of certain rose varieties, extend itself to deeper cell layers and to any aerial portion of the plant. The mycelium is thought to be perennial and capable of transmission through grafts.

Removal of all diseased or fallen leaves and thorough spraying with fungicides is recommended. For this purpose Burgundy or Bordeaux mixture may be employed at from 0.8 to 1 per cent strength, adding 0.05 per cent of gelatin previously dissolved in hot water to augment its spreading and adherent qualities.

Influence of the medium on the development of *Lophodermium nervisequum*, E. MER (*Rev. Gén. Bot.*, 25 bis (1914), pp. 511-527).—Having investigated further (*E. S. R.*, 27, p. 854) the factors in the evolution of *L. nervisequum* on fir, the author states that the conditions of the medium (including not only weather, etc., but also conditions internal to the host) are very influential in this connection. The fungus is thought to attack only those branches whose foliage is not in full vigor.

Improvement of living conditions and employment of copper fungicides, it is thought, may prevent serious damage from this fungus, which is not considered as necessarily very injurious.

Pyropolyporus everhartii as a wound parasite, G. N. HOFFER (*Proc. Ind. Acad. Sci.*, 1913, pp. 99-101, figs. 4).—Reporting observations on *P. everhartii*, thought to be of considerable economic importance in Indiana, the author adds *Quercus alba* to the list of its hosts as given by Hedgecock (*E. S. R.*, 27, p. 653).

ECONOMIC ZOOLOGY—ENTOMOLOGY.

The animal enemies of agricultural plants, M. NEVEU-LEMAIRE (In *Parasitologie des Plantes Agricoles*. Paris: J. Lammare & Co., 1913, pp. 267-655, figs. 194).—In this work the author presents a brief discussion by orders of the

more important animal enemies of plants and includes a list of these pests under the crops attacked, and of their natural enemies.

The pocket gopher, H. B. YOCOM (*Kansas Sta. Circ.* 43, pp. 4).—This is a résumé of Bulletin 172, previously noted (E. S. R., 24, p. 254).

Report of the entomologist, D. T. FULLAWAY (*Hawaii Sta. Rpt.* 1914, pp. 43-50).—On account of the author's detail to work with parasites of the Mediterranean fruit fly for the territorial government of Hawaii and for the Philippine government for periods totaling 8 months, but little entomological investigational work was conducted.

The report consists largely of accounts of insect pests of vegetables, particularly those affecting cabbage, turnip, radish, lettuce, etc. The three most important pests of crucifers in Hawaii, the imported cabbage worm, the cabbage webworm, and the diamond-back moth are considered at some length. The cabbage plant lice (*Aphis brassicæ* and *Myzus persicæ*) are at times of considerable importance, while the serpentine leaf miner, cutworms, and other caterpillars of general feeding habits, as well as grasshoppers and thrips, are pests of minor importance.

Fifteenth report of the state entomologist of Minnesota, F. L. WASHBURN (*Rpt. State Ent. Minn.*, 15 (1913-14), pp. XVI+107+100, pls. 16, figs. 26).—This report consists of papers on Useful Birds Found in Minnesota (pp. 1-19) and a Report on Inspection of Minnesota Nurseries and of Imported Nursery Stock and Ornamentals 1913-14 (pp. 20-51), by F. L. Washburn; Spraying in Minnesota (pp. 52, 53) and Some Important Tree Insects (pp. 54-56), by A. G. Ruggles; Some New Suggestions in Fly Control (pp. 57-60) and Warble Flies (pp. 61-63), by C. W. Howard; Truck Crop Insects, by W. Moore (pp. 64-68); Wireworms, by W. Williamson (pp. 69-72); Preliminary Notes on the Odonata of Southern Minnesota, by A. D. Whedon (pp. 77-103); and a complete index to volumes 1 and 2 of the popular publication known as Insect Life.

A synopsis on the Acridiidae of Minnesota, by M. P. Somes (pp. 7-100), previously noted (E. S. R., 31, p. 650), is appended.

Entomologist's report, M. P. SOMES (*Missouri Fruit Sta. Rpt.* 1913-14, pp. 4-19, pls. 2).—This report deals with the occurrence of and work with the more important enemies of orchard and small fruits for the period from September, 1913, to January, 1915.

The grape tiger moth (*Apantesis arge*), apparently unrecorded heretofore as of economic importance, was the source of severe loss at several points. The eggs, which were first observed June 23 on grape twigs and petioles in numbers varying from 70 to 280 each, hatched on June 27. The larvæ which are voracious feeders had all pupated by August 26 and adults emerged September 2. Arsenate of lead paste 2 lbs. to 50 gal. of water applied July 2 is said to have been a satisfactory means of control.

Jalysus spinosus, a small bug belonging to the family Berytidae, which has never been recorded as of economic importance, is said to have been a serious enemy of the tomato in all parts of the State and even as far north as Sioux City, Iowa. The eggs deposited on tomato stems in cages on July 27 hatched August 1. The nymphs and adults feed upon the juices of the tomato by puncturing the stem, branchlets, and in some cases the fruit itself. In southern Missouri there appear to be three or more broods each year. In addition to grape it has been observed on oak, hazel brush, sumac, peach, corn, alfalfa, and horse nettle. Though a difficult pest to control by contact insecticides it was found that by spraying late in the afternoon and early in the morning while the bugs were sluggish, good results could be obtained from the use of either kerosene emulsion or blackleaf 40.

The chrysomelid beetle *Orsodacna atra*, another insect not previously recorded as a fruit pest, was found throughout southern Missouri in the early spring eating through the flower buds of peach, cherry, apple, and pear to feed upon the stamens.

Twelfth annual report of the state entomologist of Montana, R. A. COOLEY (*Montana Sta. Bul.* 102 (1914), pp. 191-208, fig. 1).—The author presents brief notes on the occurrence of the more important insect pests during 1914.

[Destructive insects in 1913] (*Bd. Agr. and Fisheries* [London], *Ann. Rpt. Hort. Branch*, 1913-14, pp. 55-77).—The occurrence of and work with the large larch sawfly (*Lygaonematus erichsonii*), the small ermine moths (*Hypomomeuta* spp.), and diseases of bees are discussed at some length.

Entomological notes (*Cyprus Jour.* No. 35 (1914), pp. 805-807).—The notes here presented relate to injury to the grape by *Aelothrips vitis*; the steps to be taken in the destruction of *Cecidomyia ceratoniae*, which causes stunted fructification of the carob, pepper, and caper; and the damage done by the cotton bollworm, the loss in some cases amounting to 50 per cent of the yield. *A. vitis* causes a characteristic scar or spot upon the grape and also produces a curling of the tender shoots and a stunted development of the growth of twigs, stems, and leaves.

Insect pests of some leguminous plants, A. RUTHERFORD (*Trop. Agr. [Ceylon]*, 43 (1914), No. 4, pp. 319-323).—This article consists of miscellaneous notes on the insect enemies of leguminous plants in Ceylon.

Pests and diseases of the coconut palm, W. W. FROGGATT (*Dept. Agr. N. S. Wales, Sci. Bul.* 2, 3. ed., rev. and enl. (1914), pp. 63, figs. 44).—A revised and enlarged edition of the bulletin previously noted (*E. S. R.*, 26, p. 60).

The transmission of swamp fever, J. W. SCOTT (*Wyoming Sta. Rpt.* 1914, pp. 180-188).—This is in continuation of the work by Swingle, previously noted (*E. S. R.*, 30, p. 687). The work of the year was devoted to a study of the agents that might be concerned in the external transmission of the infection. By elimination it was concluded that the agent or agents must be bloodsucking and that only certain mosquitoes and biting flies have the broad geographical distribution characteristic of swamp fever. For the purpose of testing these insects a screened cage of 16-mesh wire, 22 ft. long by 20 ft. wide, was constructed.

The experiments, which are described in detail, have led to the conclusion that swamp fever can be, and under natural conditions probably is, transmitted by biting insects. In the investigation conducted the infection was transmitted either by the stable fly (*Stomoxys calcitrans*) or by certain mosquitoes, or both, the author being of the opinion that the stable fly was the agent responsible.

The control of chicken mites and lice, R. M. SHERWOOD (*Iowa Sta. Circ.* 19 (1914), pp. 2).—A brief description is given of these common fowl parasites and means for their control.

Cyanid of potassium in trees, H. A. SURFACE (*Science*, n. ser., 40 (1914), No. 1041, pp. 852, 853).—Replying to an article by Sanford relating to the subject, previously noted (*E. S. R.*, 32, p. 152), the author calls attention to observations of the use of cyanid of potassium, chlorate of potash, and sulphate of iron. Hundreds of trees treated by an agent of a company engaged in the business upon examination showed no infestation by the San José scale, while on others the scale had not been injuriously affected. A large number of the trees are said to have been killed by the treatment.

The author concludes that while some chemicals may be taken up in the trees, and may even destroy some insects, it is evident that they may be in-

jurious to the trees and should be applied with great care and only after considerable experimentation.

How to collect and preserve insects, F. E. LUTZ (*Amer. Mus. Nat. Hist. Guide Leaflet 39* (1914), pp. 21, figs. 13).—This paper furnishes information for those interested in the collection and preservation of insects.

Insects injurious to forests and forest products.—Biology of the termites of the eastern United States, with preventive and remedial measures, T. E. SNYDER (*U. S. Dept. Agr., Bur. Ent. Bul. 94, pt. 2* (1915), pp. V+13–85, pls. 15, figs. 11).—This account is based largely upon investigations conducted by the author during 1910 and 1911 as to the character and extent of damage to telephone and telegraph poles and mine props by wood-boring insects as described in Part 1 (*E. S. R.*, 25, p. 51), together with additional experiments conducted during the past three years.

Termites, commonly known as white ants, are among the most destructive insects of North America to both crude and finished forest products. The species considered in this paper are *Leucotermes flavipes* and *L. virginicus*, the former widely distributed over the United States, while the recorded distribution of the latter is more limited.

The subject is dealt with under the headings of history, biological experiments, communal organization, the different castes—polymorphism, the life cycle, cannibalism, situation of the different forms in the nest, the swarm or so-called nuptial flight, the establishment of new colonies, the royal pair and other reproductive forms, dates of the swarming of *Leucotermes*, association with ants, termitophilous insects, parasites, summary and conclusions based on the results of the experiments, the damage to forest products, preventives, remedies, and “immune” woods, and method of obtaining photographs for the illustrations.

A bibliography is included.

“Thrips” in orchards.—A warning to fruit growers, W. B. GURNEY (*Agr. Gaz. N. S. Wales*, 25 (1914), No. 8, pp. 685–687).—In 1913 thrips destroyed a large percentage of the apple crop, and also attacked pear and other blossoms, causing very heavy loss to many growers. This outbreak is thought to have been the worst to take place for many years. The early flowering forms are said to escape very much damage, the late blossoming apples being those chiefly injured. *Thrips tabaci* is thought to be the species concerned.

Diaspis pentagona and *Prospaltella berlessei* in the Province of Venice at the end of 1913, A. BERLESE (*Redia*, 9 (1913), No. 2, pp. 235–283, figs. 20).—This paper reviews at some length the progress made up to the end of 1913 in the control of the mulberry or West Indian peach scale (*Aulacaspis pentagona*) by *P. berlessei*. A previous account of the benefits resulting from the work of this parasite has been noted (*E. S. R.*, 29, p. 854).

Aphids on grain and cantaloups, C. W. WOODWORTH (*California Sta. Circ. 125* (1915), pp. 4, fig. 1).—A popular account of the oat and cotton aphids (*Aphis avenae* and *A. gossypii*).

Two clover aphids, EDITH M. PATCH (*U. S. Dept. Agr., Jour. Agr. Research*, 3 (1915), No. 5, pp. 431–433, figs. 3).—This paper discusses the long-beaked clover aphid (*Aphis brevis*) and the short-beaked clover aphid (*A. bakeri*), which have been rather generally confused in collections under the latter name. The range of both species extends nearly all, if not quite, across the continent.

A. brevis leaves the hawthorn, the leaves of which it causes to curl, during June and early July and returns late in the season before producing the sexual generation. Fall migrants were taken on cultivated plum (*Prunus* spp.) by the author, but no spring collections have as yet been made from that host. Ap-

parently the same species was collected in June and July from the twigs and terminal leaf curls of the Japan quince (*Cydonia japonica*). In transfer tests during 1912 *A. brevis* was found to accept both alsike and other clover (*Trifolium* spp.). Migrants placed on alsike and white clover produced nymphs that fed with apparent satisfaction on the test plants. Sweet pea (*Lathyrus odoratus*) vines were found to be infested by this species in August.

A. bakeri was taken from *Trifolium pratense* at Orono, Me., about the middle of August. It is found upon shepherd's-purse (*Capsella bursa-pastoris*) in the fall and early spring, but whether there is a migration between shepherd's-purse and clover has not been determined. Specimens from hawthorn in Oregon were examined, and it is reported to occur on apple (*Malus* spp.) in Colorado. The author made a single collection of a fall migrant on hawthorn at Orono on October 1, 1914.

Our common butterflies, F. E. LUTZ (*Amer. Mus. Nat. Hist. Guide Leaflet 38* (1914), pp. 25, figs. 40).—A popular account.

Some notes on the life history and habits of *Lauron vinosa*, T. H. JONES (*Insecutor Inscitiæ Menstruus*, 2 (1914), No. 7, pp. 108–111).—The larva of this lepidopteran is said to cause the death of *Heliotropium indicum*, which occurs as a weed in and about the sugar-cane fields at Rio Piedras, P. R.

The Hessian fly, F. M. WEBSTER (*U. S. Dept. Agr., Farmers' Bul. 640* (1915), pp. 20, figs. 17).—This is a revision of Circular 70 of the Bureau of Entomology, previously noted (E. S. R., 17, p. 1089).

Life history of the Mediterranean fruit fly from the standpoint of parasite introduction, E. A. BACK and C. E. PEMBERTON (*U. S. Dept. Agr., Jour. Agr. Research*, 3 (1915), No. 5, pp. 363–374, pls. 2).—The authors first describe methods for rearing fruit flies which developed during the course of their work. During warm weather nearly all puparia are formed in from one to two hours. The minimum length of the pupal stage is 6 days when the mean temperature ranges from about 76 to 79° F., but even during the warmest weather in Honolulu the larger proportion of any lot of pupæ required from 9 to 11 days before yielding adults. The period may be increased to at least 19 days when the daily mean drops to about 69 to 71°. The authors have found that the fly can pass from egg to adult if kept in the dark in cold storage at 56 to 57°, and that at this temperature practically all pupæ yield adults from 37 to 41 days after pupation. "Pupæ placed in cold storage in the light at a temperature varying between 58 and 62° were apparently unaffected by the cold, except that the length of the stage was increased to from 29 to 31 days for pupæ which were about three hours old when placed in cold storage. In carrying pupæ from place to place for rearing purposes a temperature of less than 56 to 60° is not advised, as great mortality occurs. Thus, from about 300 pupæ 1 day old placed in cold storage at about 50° on June 2 and removed to a normal summer temperature at Honolulu on July 22, only 8 adults emerged during the period from July 24 to 26."

Well-fed Mediterranean fruit flies were kept alive in jars when fed on sweetened fruit juices for more than 5 months, although 50 per cent usually die within two months after emergence. Oviposition was found to take place in Hawaii as early as five days after emergence during very warm weather, but not for about 10 days when the temperature ranged between 68 and 72°. Records kept of females showed that during the first 18 weeks of the life of one female more than 499 eggs were deposited, at the end of which time she was in a thrifty condition. Two other females during the same period deposited 416 and 336 eggs, respectively, while a fourth female living but 80 days deposited 312 eggs. The authors point out differences in habits between the adult Mediterranean fruit fly and the adult melon fly (*Bactrocera cucurbitæ*), the latter being far more

hardy and more irregular in habits of oviposition. Details relating to the observations reported are presented in tabular form.

Reconnaissance of fruit fly parasites, W. M. GIFFARD (*Hawaii. Forester and Agr.*, 11 (1914), No. 11, pp. 334-337).—Investigations made in the Kona district on the island of Hawaii during October by the author and E. A. Back, of the Bureau of Entomology of this Department, show that the braconid parasites *Opius humilis* introduced from South Africa and *Diachasma tryoni* from Australia by Silvestri have become established and are increasing in numbers. It was found that the infestation of coffee berries by the fruit fly in this district during the year was at least 50 per cent less than in 1913.

Sheep maggot flies, W. W. FROGGATT (*Agr. Gaz. N. S. Wales*, 25 (1914), No. 9, pp. 756-758, pl. 1).—This is a description of the more common sheep maggot flies, accompanied by a colored plate, with the eight species described.

The parasite of the sheep maggot fly (*Nasonia brevicornis*), W. W. FROGGATT (*Agr. Gaz. N. S. Wales*, 25 (1914), No. 9, pp. 759-764).—This chalcidid, originally described from Illinois in 1909 (E. S. R., 23, p. 161), where it was reared from pupæ of different species of Diptera and since recorded from Chile, is reported by the author to have been discovered in New South Wales and Queensland, and to be a common parasite of the puparia of the blow flies, there known as "sheep-maggot flies."

In breeding experiments in which all kinds of blow flies and maggots were used it was found that the parasite showed a preference for the smooth, thin-skinned pupæ of *Calliphora villosa*, *C. oceanicæ*, and *C. erythrocephala*, and infested the stoutly-spined pupæ of *C. rufifacies* only when the others were unobtainable. The very noticeable decrease within a few years of the common yellow blow flies and *Ophyra nigra* in the Northwest during the summer months leads the author to think that these parasites first attacked the pupæ of those blow flies with smooth pupæ and have only recently turned their attention to the harder spiny pupæ of the "hairy maggot" of *C. rufifacies*.

Ten generations of this parasite are said to have been produced in the course of six months from a few hundred of parasitized pupæ originally collected at Brewarrina. The eggs hatch in about three days' time, seven days are required for the development of the larvæ, and about five days are passed in the pupal stage.

The eradication of the sheep tick, L. D. SWINGLE (*Wyoming Sta. Bul.* 105 (1915), pp. 27-47).—This is a report of experiments with a number of dips for controlling the sheep tick, a life-history study of which has been previously noted (E. S. R., 29, p. 756). It appears that one dipping can not invariably be depended upon to eradicate the tick, while two dippings, with an interval of 24 days during warm weather and 26 days in the spring or fall, either with coal-tar products or with Cooper's Powder will absolutely destroy them. Early fall appears to be the best time for the dipping.

List of Tachinidæ from the Province of Quebec, J. D. TOTHILL (*Ottawa Nat.*, 28 (1914), No. 9, pp. 113-116).—Forty-nine species of this family of dipterous parasites are listed as occurring in the Province of Quebec.

[The hen flea (*Sarcopsylla gallinacea*)], E. V. WILCOX (*Hawaii Sta. Rpt.* 1914, p. 24).—This pest made its appearance in Honolulu during the year and is said to be spreading rapidly. In a test of several insecticides it was found that a single application of kerosene killed about 75 per cent of the fleas. All of the fleas were killed by an application of carbolated vaselin (2 per cent carbolic acid) and by a 3 per cent solution of carbolic acid in glycerin and water. Zenoleum in a 3 per cent solution was about as effective as kerosene. The trouble is said to be so serious that poultry raisers should thoroughly spray

infested yards, and since rats may also carry these fleas an attempt should be made to eradicate them.

List of generic names and their type species in the coleopterous superfamily Scolytoidea, A. D. HOPKINS (*Proc. U. S. Nat. Mus.*, 48 (1914), pp. 115-136).—This is the second contribution toward a monograph of the scolytoid beetles.

An alphabetical list is given of the generic names, including the author, the original reference, the type species, the author of the species, and if not monobasic the authority for the designation and the locality or country from which the type is described. No attempt is made to indicate the synonyms and no distinction is made between generic and subgeneric names, but the generic and subgeneric names in the superfamily that have been published to December 2, 1912, have been included. An alphabetical list is given of the names of type species, including the names of the authors, the names of the genera of which the species were originally described, and the names of the genera of which they are the type.

Classification of the Cryphalinae with descriptions of new genera and species, A. D. HOPKINS (*U. S. Dept. Agr. Rpt. 99* (1915), pp. 75, pls. 4, fig. 1).—This is the fourth contribution toward a monograph of the scolytoid beetles, of which the first and third have been previously noted (*E. S. R.*, 21, p. 557; 32, p. 658) and the second is noted above. The subfamily Cryphalinae of the family Ipidae includes a group of ambrosia beetles, also known as pin-hole borers and timber beetles, which are exceedingly detrimental to crude forest products, wine and beer casks, and other similar products; a species destructive to the tea plant in Ceylon; and many seed-infesting insects, especially those of the date palm. Numerous new species are described and genera erected.

Xyleborus compactus, a borer of tea and coffee, A. RUTHERFORD (*Trop. Agr. [Ceylon]*, 42 (1914), No. 2, pp. 131, 132).—This is a report of studies of a borer, widely distributed in Ceylon, which resembles the shot-hole borer of tea (*X. fornicatus*), but works in a different way. It is reported to attack both coffee and tea plants, as high as 50 per cent of the plants in a tea nursery at Wattagama having been injured.

Plants other than tea from which *Xyleborus fornicatus* (shot-hole borer of tea) has been taken, A. RUTHERFORD (*Trop. Agr. [Ceylon]*, 42 (1914), No. 4, pp. 307-309).—An annotated list of plants other than tea that are known to have been attacked by this beetle.

The Hymenoptera of the Georgetown Museum, III, IV, and V, P. CAMERON (*Timehri, Brit. Guiana*, 3. ser., 2 (1912), Nos. 1, pp. 207-231; 2, pp. 413-440; 3 (1913), No. 1, pp. 105-137).—Part 3 of this paper (*E. S. R.*, 26, p. 353) deals with the marabuntas or wasps, 28 new species of social and 42 of solitary wasps being described for the first time. Part 4 deals with the fossorial Hymenoptera and part 5 presents descriptions of species belonging to the families Chalcididae, Perilampidae, Eurytomidae, Encyrtidae, Proctotrypidae, etc.

The mason bees, J. H. FABRE (*New York: Dodd, Mead & Co.*, 1914, pp. VIII+315).—This is a translation of the essays on *Chalicodoma* spp. from the author's *Souvenirs entomologiques*.

Apiary work, J. B. THOMPSON (*Guam Sta. Rpt.* 1914, pp. 16, 17).—This is a brief statement of the progress of apiculture in Guam. It is stated that since the inauguration of the apiary work at the station not less than 12 parties have obtained for their own use improved movable frame hives and are now handling bees on a more or less extensive scale under greatly improved conditions, while the governor of the Island has added a course on practical bee keeping to the work of common schools.

Recent experience and progress in bee keeping in Germany, F. GERSTUNG (*Internat. Inst. Agr. [Rome], Mo. Bul. Agr. Intel. and Plant Diseases*, 5 (1914), No. 6, pp. 716-721).—This is a more detailed report than that previously noted (E. S. R., 30, p. 759).

The morphology, biology, and economic importance of *Nosema bombi* n. sp., parasitic in various humblebees (*Bombus* spp.), H. B. FANTHAM and ANNIE PORTER (*Ann. Trop. Med. and Par.*, 8 (1914), No. 3, pp. 623-638, pl. 1).—“*N. bombi* n. sp. is parasitic in the alimentary canal and Malpighian tubules of various species of humble (or bumble) bees, *Bombus agrorum*, *B. hortorum*, *B. latreilleus*, *B. lapidarius*, *B. sylvarum*, and *B. terrestris* being affected. It may also pass naturally to the hive bee, *Aphis mellifica* and to *A. florea*. It is pathogenic to all the above hosts. The morphology of *N. bombi* resembles that of *N. apis* in its general outlines. . . .

“The mode of infection is contaminative by means of infected food and drink. Larvæ can become infected from the food soiled by the parental excrement in which they hatch out. *N. bombi* can pass from one species of humblebee to another without change of morphology or virulence. When it reaches hive bees its facies is preserved, but its pathogenic action is accelerated. . . . The dearth of humblebees due to the action of *N. bombi* has resulted in less red clover seed in certain districts. The possibility of the contraction of microsporidiosis of humblebees by hive bees is also not without significance.

“Preventive measures from the economic standpoint take two main forms: (a) Destruction by burning of all dead humblebees found and of the nests of moribund bees when they are detected. (b) Prevention of the thoughtless destruction of healthy nests, more especially by children. The destruction of the diseased and preservation of the healthy humblebees are both in the interests of agriculturists.”

Some observations on the life history and bionomics of the knapweed gall fly (*Urophora solstitialis*), J. T. WADSWORTH (*Ann. Appl. Biol.*, 1 (1914), No. 2, pp. 142-169, pls. 2, fig. 1).—A discussion of the life history and bionomics of the trypetid gall fly *U. solstitialis* in connection with the literature relating to it.

The anatomy and life history of *Agchylostoma duodenale*, II, A. LOOSS (*Rec. Egypt Govt. School Med. Cairo*, 1911, pp. 163-613, pls. 9; rev. in *Jour. Econ. Biol.*, 7 (1912), No. 1, p. 27; *Jour. Roy. Army Med. Corps*, 19 (1912), No. 1, pp. 42-55, figs. 22).—Following a brief introduction the author gives a general account of the comparative anatomy, classification, and development of nematodes, with special consideration of those points which have led earlier authors into error. This is followed by a detailed account of the development, in which the egg, its shell, contents, and stage at which the eggs are laid, are dealt with, also the eggs of other nematodes, which have been, or might be mistaken for the eggs of the species treated of. The consideration of fertilized and unfertilized eggs, the embryonic development, the hatching of the embryos, etc., form a second section, and separate sections are devoted to the consideration of the conditions necessary for the development of the eggs and larvæ; the biology of the mature larvæ; modes of infection; the migration of the larvæ; the symptoms produced by the migration of the larvæ in man; and the comparative frequency and practical significance of the two modes of infection, i. e., oral and dermal.

An extensive bibliography, index to authors quoted, and a list of the genera and species referred to are included.

FOODS—HUMAN NUTRITION.

Second Congress of Alimentation, Liège, October 1-4, 1911 (2. *Cong. Aliment. Liège, 1911, pt. 1, pp. 393*).—In this report of the second food congress, held at Liège, October 1-4, 1911, are included a number of papers presented to the congress which relate to various subjects under food and nutrition, such as milk and dairy products, meat and meat products, fatty foods, cereal foods, beverages, condiments, physiology, etc. The following may be mentioned: Changes Undergone by Canned Meats, by G. Mayer; Quantitative Analysis of Cereals as an Index of their Bread-making Value, by R. Ledent; Pastry and Hygiene, by J. B. E. Haefelé; Composition and Uses of Artificial Honey, by G. Ronnberg; The Influence of Several Different Foods upon the Digestion of Each, and upon the Extent of their Utilization, by E. Zunz; Effect of Cooking on the Digestion of Foods, by E. Zunz; and Dried Milk as Food for Infants, by Peers de Nieuwburg.

Bibliography of Belgian publications on nutrition and hygiene, A. J. J. VANDEVELDE and H. W. J. VAN BERESTEYN (*Verlag. en Meded. K. Vlaam. Acad. Taal en Letterk., 1913, pp. 697-756*).—A number of references are given which are listed both by authors and subjects.

Physiological bibliography (*Bibliographia Physiol., 3. ser., 9 (1913), No. 2, pp. 233-399*).—A number of references to English, French, German, and Italian work on general physiological problems, including respiration, digestion, and nutrition, are given.

The nutritive value of ossein and its use in the diet, E. MAURIÉ (*Compt. Rend. Acad. Sci. [Paris], 159 (1914), No. 8, pp. 450-452*).—The author suggests the use of dried ossein, in powdered form, of which he has used daily as much as 75 gm. added to bouillon. It is stated that the ossein is readily assimilated.

Meat poisoning and the isolation and nomenclature of meat poisoning bacteria, W. PFEILER and F. ENGELHARDT (*Mitt. Kaiser Wilhelms Inst. Landw. Bromberg, 6 (1914), No. 4, pp. 244-260*).—In an investigation of several cases of meat poisoning, attributed to bacteria of the paratyphoid and Gaertner types, a bacteriological study was made of these organisms.

The food value and toxicity of fungi, U. SELAN (*Rivista [Conegliano], 5. ser., 20 (1914), Nos. 21, pp. 496-500; 22, pp. 515-518*).—Food values and proximate analyses are given. Practical methods for distinguishing between edible and poisonous varieties and remedial measures for fungi poisoning are discussed.

Some Colorado mushrooms, B. O. LONGYEAR (*Colorado Sta. Bul. 201 (1914), pp. 34, pl. 1, figs. 27*).—Botanical and general descriptions are given of both edible and poisonous species of fungi. Popular misconceptions regarding mushrooms and toadstools are discussed and the author recommends the recognition of these plants by their botanical characters rather than by some general or uncertain rule. Directions are given for cooking and preparing mushrooms for the table.

Barley (*Food and Drugs, n. ser., 2 (1914), No. 4, pp. 196-201, figs. 2*).—General data are given regarding the cultivation, chemical composition, nutritive value, and uses of barley.

Milling and baking studies, A. ATKINSON and B. W. WHITLOCK (*Montana Sta. Bul. 101 (1914), pp. 176-193, figs. 23*).—In the first annual report of the State Grain Laboratory of Montana the equipment is described briefly and the results are reported of chemical analyses and milling and baking tests carried out with 14 varieties of wheat, including durum and both hard and soft winter and spring wheats. The factors determined in the baking tests were the

percentage of absorption and the weight, volume, color, and texture of the loaf. It was found that the highest protein and gluten content do not necessarily give the best loaf. Red Russian and Minnesota 188 gave the best general results.

Baking tests of patent, straight, and clear flours from spring and winter wheats showed the highest grade in volume, color, and texture of the loaf from spring patent flour.

The use of sugar in bread making, A. HERZFELD (*Deut. Zuckerindus.*, 39 (1914), No. 48, pp. 960, 961).—Bread prepared with the addition of molasses and other sirups, according to the author, proved very satisfactory. The taste was good and the crumb retained its moist condition. The use of sugar in this form is recommended as a means of increasing its consumption.

Uses of cassava, H. CARACCILO (*Bul. Dept. Agr. Trinidad and Tobago*, 13 (1914), No. 83, pp. 278, 279).—Notes are given on the utilization of cassava in the home.

The manufacture of cassava farine, L. A. BRUNTON (*Bul. Dept. Agr. Trinidad and Tobago*, 13 (1914), No. 83, pp. 277, 278).—The technique employed in cleaning, grading, draining, sifting, and drying the product is described.

The composition of Hawaiian fruits and nuts, ALICE R. THOMPSON (*Hawaii Sta. Rpt. 1914*, pp. 62-73).—To secure information regarding their chemical composition, analyses were made of normal and fully ripe samples of a large number of fruits and nuts commonly occurring in Hawaii. Among the tropical fruits included were the mango, avocado, banana, breadfruit, Jack fruit, papaya, and guava.

A bunch of Chinese bananas was picked while the fruit was very green and allowed to ripen in the laboratory. Analyses of the fruit were made when very green, when slightly yellow, and when entirely ripe. Papayas were analyzed on the day they were picked from the tree and samples of the fruit were examined in several stages of ripeness, ranging from fruit which was immature and undersized to that fully ripe.

During the ripening process of the banana it was found that the total solids decreased slightly. "The insoluble solids are almost as high as the total solids in the green banana, but decrease very rapidly on ripening; and in the ripe fruit amount to less than 3 per cent. The ash is high throughout and does not change appreciably. The acid content is but a few tenths of 1 per cent and appears to reach its maximum when the fruit is half ripe, after which it decreases. The protein is fairly high and remains constant." During the ripening of the banana the starch was found to be transformed into sugar. "When green, the starch is exceedingly high, amounting to about 20 per cent, while the sucrose and reducing sugars amount to a few tenths of a per cent. At the half-ripe stage the sugars have increased several per cent and in about the same proportion that the starch has decreased. In the fully ripened stage the sugars have increased greatly and the starch has almost disappeared. The hydrolyzable carbohydrates, other than starch or sucrose, are small in amounts."

In the case of the papaya the total solids were found to be low throughout the ripening process and increased as the fruit ripened. "The insoluble solids are about 3 per cent in the green fruit and decrease to about 1 per cent in the ripe fruit. The ash, acid, and protein occur in small quantities and are quite constant. The fruit contains not more than a trace of sucrose. The reducing sugars in the green fruit, however, amount to over 2 per cent, but increase rapidly as the fruit increases in size and approaches ripeness. The hydrolyzable carbohydrates are almost nil, and fat, fiber, and undetermined matter

occur only in small amounts. It is logical to conclude, therefore, that, as the fruit when green has no store of carbohydrates upon which to draw, it must obtain its sugars by translocation from the trunk of the trees.

Evaporated apples, A. MCGILL (*Lab. Inland Rev. Dept. Canada Bul. 293* (1914), pp. 25).—An examination of 184 samples of evaporated apples, purchased in Canada, for moisture, quality, soundness, and cleanliness is reported. Of these, 147 samples were regarded satisfactory as containing not more than 27 per cent of water and being fairly sound and clean. Full analytical data are given, together with definitions and recommendations for standards.

Iron in tomatoes, C. A. BRAUTLECHT and G. CRAWFORD (*Jour. Indus. and Engin. Chem.*, 6 (1914), No. 12, pp. 1001, 1002).—The authors report analyses of tomatoes for water, ash, and iron. The iron content of the tomatoes, calculated from the iron in the ash, averaged 0.023 per cent.

The influence of glucose on the cooking temperatures of candy sirups, AMY DANIELS and MARTHA A. TROXELL (*Jour. Home Econ.*, 6 (1914), No. 5, pp. 457-460).—Experimental data reported led to the conclusion that the temperatures usually given for candy cookery must be revised, as they are generally intended for candies in which cane sugar is the principal constituent. When glucose is used in significant quantity lower temperatures give the desired results. A table is given showing temperatures for typical candies in which glucose is used.

The influence of glucose on the cooking temperatures of candy sirups, AMY DANIELS (*Jour. Home Econ.*, 6 (1914), No. 5, pp. 482-484, fig. 1).—Methods of determining the temperature of cane sugar alone and cane sugar with glucose are given. See also the above.

Strained honey, A. MCGILL (*Lab. Inland Rev. Dept. Canada Bul. 289* (1914), pp. 27).—Definitions of honey are given and the results reported of the analysis of 194 samples purchased chiefly as strained honey. One hundred fifty-nine of these samples met the requirements of existing standards.

Olive oil and salad oil, A. MCGILL (*Lab. Inland Rev. Dept. Canada Bul. 294* (1914), pp. 15).—This bulletin is a report of the analysis of 114 samples of edible oil sold as salad oil or olive oil, of which 85 were found to be genuine olive oil and 29 to consist entirely or in part of cottonseed oil.

The rancidity of olive oil and the oxidation of oleic acid in the presence of solar light, F. CANZONERI and G. BIANCHINI (*Ann. Chim. Appl. [Rome]*, 1 (1914), No. 1-2, pp. 24-32).—This paper presents analytical data bearing on the chemical constitution of fatty acids.

Coffee and coffee substitutes, A. MCGILL (*Lab. Inland Rev. Dept. Canada Bul. 290* (1914), pp. 37).—The results are given of the inspection and analysis of 339 samples purchased as coffee or coffee substitutes. Of these, 199 samples were found to be genuine. The remainder consisted entirely or in part of chicory and roasted cereals.

Egg albumin in baking powder, H. L. JACKSON (*Jour. Indus. and Engin. Chem.*, 6 (1914), No. 12, pp. 998-1001).—This paper summarizes the results of three series of comparative baking tests in which baking powders with and without egg albumin were used. This work, in the opinion of the author, does not show any usefulness of egg albumin in baking powder when bakings are carried out under normal conditions, "and especially in the very small quantity usually present, i. e., from 0.1 to 0.2 of 1 per cent. When the temperature of the oven is too low for baking biscuits properly, egg albumin seems to aid in producing a better biscuit. When the dough is allowed to stand several hours before baking a much better biscuit is produced by the powder to which egg albumin has been added."

[Food and drug analysis], edited and compiled by R. E. STALLINGS (*Mo. Bul. Ga. Dept. Agr.*, 1 [1914], No. 7, pp. 28).—This report contains the results of the analysis of a large number of miscellaneous food samples and drugs.

[Preliminary report of dairy and food commissioner], J. FOUST (*Penn. Dept. Agr., Mo. Bul. Dairy and Food Div.*, 12 (1914), No. 5-6, pp. 133).—The work carried on under the state food and drug laws during the year ended December 31, 1913, is briefly reviewed and some general data regarding food inspection and analysis are given.

[Food inspection and analysis], J. FOUST ET AL. (*Penn. Dept. Agr. Bul.* 247 (1914), pp. 82).—This bulletin contains hints regarding the care of eggs on the farm, reports of licenses issued for the sale of oleomargarine, the results of an examination of a large number of miscellaneous food products, and a statement of the prosecutions brought under the state food and drug law.

[Food and drug inspection and analysis], E. F. LADD and ALMA K. JOHNSON (*North Dakota Sta. Spec. Bul.*, 3 (1915), No. 15, pp. 249-264).—The bulk of this bulletin consists of a further report, by T. Sanderson, on the study of the variation of the weight of a 50-lb. sack of flour during storage (*E. S. R.*, 30, p. 667), from which the following conclusions are drawn:

"The flour with about 11 per cent moisture will vary less in weight than if the moisture be more or less. . . .

"The normal moisture content of flour in this climate seems to be about 11 per cent. . . . The normal moisture content of wheat in this climate seems to be about 13 per cent. . . .

"Flour made from wheat with normal moisture 13 per cent with not to exceed 2 per cent added moisture in tempering will produce a flour with moisture content of about 11 per cent that will not vary in storage more than 2 per cent, and the variation is as liable to be above as below the original weight, owing to atmospheric conditions. . . .

"Ordinarily wheat with moisture content of between 14 and 15 per cent moisture is in prime condition to mill."

General and analytical data are also given regarding a number of food products and drugs.

Housewives retail market prices, edited by P. Q. FOY (*Housewives Retail Market Prices*, 1 (1914), Nos. 1-40, pp. [8] each; 41, pp. [10]).—This summary of data regarding retail market prices is published under the direction of Mrs. J. Heath, national president of the Housewives League.

The commercial food container, MARY DUDDERIDGE (*Housewives League Mag.*, 4 (1914), No. 4, pp. 11-14, figs. 8).—Data are given in this article regarding the loss of weight by absorption from foods in paper, wood, or wood pulp containers. The weight of the material absorbed by the dish varied from about 6 gm. to as high as approximately 52 gm. The greatest absorption was noted in the wood pulp container and the smallest in the wood container.

Nickel cooking utensils, M. VUK (*Ztschr. Untersuch. Nahr. u. Genussmtl.*, 28 (1914), No. 2, pp. 103, 104; *abs. in Chem. Zentbl.*, 1914, II, No. 13, p. 844).—The solubility of different kinds of nickel was tested by exposing 16,800 sq. mm. of surface to the action of 700 cc. of 5 per cent acetic acid for 2½ hours. The amount of dissolved nickel varied from 16 to 65 mg. Rolled nickel was less soluble than the cast, electrolytic, or drawn nickel.

Chinese-Japanese cook book, SARA BOSSE and ONOTO WATANNA (*Chicago: Rand, McNally & Co.*, 1914, pp. 120).—Recipes are given for the preparation of a number of Chinese and Japanese dishes.

The vitamins and subjective factors in eating, W. STERNBERG (*Arch. Verdauungskrank.*, 20 (1914), No. 2, pp. 200-209; *abs. in Jour. Amer. Med. Assoc.*, 62 (1914), No. 21, p. 1696).—The author emphasizes the importance to the diet

of the flavors of foods and believes that much of what is being called vitamins is included in flavor. In his opinion the senses of smell and taste are more sensitive to chemical changes than are chemical tests. Warmed-over dishes are less appetizing than fresh dishes because they have undergone some chemical change. Loss of appetite, nausea, and some dietary deficiency disease may result from the lack of relish of food, and the author emphasizes the importance of the preparation of food which will appeal to the senses of sight, smell, and taste.

Flavors and vitamins (*Jour. Amer. Med. Assoc.*, 63 (1914), No. 26, p. 2296).—The investigations of a number of authors are here summarized, all of which emphasize the importance in the diet of flavors, spices, and the preparation of food in such a way that it will appeal to the esthetic sense.

The influence of a diet poor in calcium upon the composition of growing bones, S. WEISER (*Biochem. Ztschr.*, 66 (1914), No. 1-3, pp. 95-114, figs. 3).—Previously noted from another source (*E. S. R.*, 32, p. 465).

Contribution to the metabolism of lecithin and cholesterin with reference to the presence in the urine of trimethylamin, A. PATTÀ (*Arch. Farmacol. Sper. e Sci. Aff.*, 18 (1914), Nos. 7, pp. 284-288; 8, pp. 289-298).—From a series of experiments with various laboratory animals (dogs and rabbits), the results of which are presented here in detail, the author draws the general conclusion that the presence of trimethylamin in the urine is not, as generally believed, an indication of the metabolism of lecithin, either that obtained from the food or from the decomposition of body fat.

Metabolism of creatin and creatinin under normal conditions and as the result of suppressing the hepatic circulation, V. SCAFFIDI (*Arch. Ital. Biol.*, 61 (1914), No. 2, pp. 153-168).—The experimental ingestion of creatin and creatinin by laboratory animals (dog and duck) gave evidence that the liver is not a necessary organ for the metabolism of creatin and creatinin.

The presence of creatinin in the muscles and the behavior of creatin during fatigue, V. SCAFFIDI (*Arch. Ital. Biol.*, 61 (1914), No. 2, pp. 168-176).—Experiments with laboratory animals (frogs and dogs) are reported from which the author draws the following conclusions:

In the muscle of the animals studied, and probably in muscular tissue in general, pre-formed creatinin does not exist. Creatinin is not found in the muscles of the frog as a result of fatigue. It is probable that creatinin is destroyed as fast as formed in muscular tissue. As the result of muscular fatigue creatin undergoes no marked modifications. It is difficult to determine to what extent creatin is consumed and rebuilt from the protein decomposition products in the individual muscle.

Gastro-intestinal studies.—IV, Direct evidence of the secretion of a gastric juice of constant acid concentration by the human subject, M. E. REHRUSS and P. B. HAWK (*Jour. Amer. Med. Assoc.*, 63 (1914), No. 24, pp. 2088-2092, figs. 7).—The results of experiments with both normal and pathological individuals indicated the secretion by the human stomach of a gastric juice which has a constant acidity.

The elimination of water under different conditions of normal respiration, A. AZZI (*Arch. Ital. Biol.*, 61 (1914), No. 2, pp. 203-216, figs. 6).—By means of experiments with a respiration apparatus the relation existing between the elimination of water in expired air and feeding and bathing was studied. In part the following conclusions were drawn:

The kind of food has no influence upon the quantity of water in expired air. The ingestion of food, however, has a variable effect. The quantity of water eliminated in expired air increases or decreases according as a sensation of heat or cold is experienced after ingestion of food. The water content of the

expired air was increased by a warm bath and decreased by a cold bath. These experiments tend to show that the quantity of water in expired air is regulated by the vaso-motor nerve system.

Energy metabolism under conditions of muscular activity.—I, Walking experiments on a horizontal plane, E. BREZINA and H. REICHEL (*Biochem. Ztschr.*, 63 (1914), No. 2-3, pp. 170-183, figs. 5).—Results are reported of experiments in which was studied the effect upon the total energy metabolism of varying the load carried and the rate of walking on a horizontal plane. A mathematical discussion of the results is also given and mathematical expressions formulated which express the relationship between the rate of walking and the weight of the load upon metabolism.

Energy metabolism during marching.—II, Walking experiment with an inclined plane, E. BREZINA and W. KOLMER (*Biochem. Ztschr.*, 65 (1914), No. 1-2, pp. 16-34, fig. 1).—Continuing previous work (E. S. R., 26, p. 872), the authors report the results of a large number of treadmill experiments in which the respiratory observations were made by means of a modified respiration apparatus. By varying the angle of inclination and the actual amount of work done, an attempt was made to determine the relationship between total work, in terms of calories, and the respiratory quotient. A gradual increase in the respiratory quotient was found to coincide with the increase in calories.

Energy metabolism in marching.—III, The laws of walking up an inclined plane, E. BREZINA and H. REICHEL (*Biochem. Ztschr.*, 65 (1914), No. 1-2, pp. 35-70, figs. 8).—From the experimental data presented in the above article, a mathematical expression is derived for determining the total work done per meter of distance covered and per kilogram of body weight.

Studies of the blood after muscular work, O. COHNHEIM (*Zentbl. Physiol.*, 28 (1914), No. 12, p. 747).—After hill climbing and cycling the hemoglobin content of the blood decreased while the serum concentration increased. Perspiration alone without muscular work led to a higher hemoglobin and serum concentration.

On the action of temperature and humidity on the organism, F. S. LEE and E. L. SCOTT (*Proc. Soc. Expt. Biol. and Med.*, 12 (1914), No. 1, pp. 10-12).—Experiments are reported in which laboratory animals (cats) were confined in a chamber and supplied with moving air at various temperatures and conditions of humidity.

“Under the influence of the high temperature and the high humidity the total amount of work which the muscles are capable of doing before exhaustion sets in is markedly diminished; and the total period of working power is shortened, except in the case of the diaphragm.

“The observations show that the bodily temperature of the animals rises in the atmosphere of high temperature and high humidity.”

The qualitative relation between temperature and standard metabolism in animals, A. KROGH (*Internat. Ztschr. Phys. Chem. Biol.*, 1 (1914), No. 5-6, pp. 491-508, figs. 5).—Experiments were carried out with laboratory animals (frogs and dogs) in which the oxygen consumption was used as an index of metabolism. Experimental technique and apparatus used are described in detail and extended experimental data are reported, which may be briefly summarized, in part, as follows:

In studying the effect of temperature upon metabolism a distinction must be made between the influence upon the central nervous system and the influence upon the reaction velocity of the metabolic processes in the tissues themselves. According to the author, when animals are studied under standard conditions—all nervous influences being abolished—the influence of temperature

on the metabolism of an animal is regular and constant and can be expressed in a definite curve.

A micro-respiration apparatus correction, A. KROGH (*Biochem. Ztschr.*, 66 (1914), No. 6, p. 512).—Formulas and values given in a previous article (E. S. R., 32, p. 67) are corrected.

ANIMAL PRODUCTION.

Pattern development in mammals and birds, G. M. ALLEN (*Amer. Nat.*, 48 (1914), Nos. 571, pp. 385-412; 572, pp. 467-484; 573, pp. 550-566, figs. 62).—The author summarizes the principal points of this paper as follows:

"In mammals and birds that normally are completely pigmented there are certain definite points of the body from which as centers the tendency to develop pigment in the epidermal structures may become less and less. Outward from each of these centers pigment formation spreads to include very definite areas which in wholly pigmented animals overlap slightly at their borders or are at least contiguous.

"A reduction in the area covered by any of these primary patches results in a white mark at the line of junction of two contiguous color patches, where no pigment is produced. These white marks between the primary patches are spoken of as primary breaks.

"Through a study of the breaks in pied individuals of domesticated species of mammals and birds the boundaries of the primary patches have been determined. These are homologous in the two groups and subject to a certain amount of variation in different types. They are: A median crown patch, unpaired, and five paired patches on the opposite sides of the body, which are named from the general areas they cover, the ear, neck, shoulder, side, and rump patches. Their limits are more precisely defined under the different species treated.

"These patches are physiologically independent of each other and may be differently colored in the same individual.

"Pied patterns among many wild species have been brought about through the areal reduction of these pigment patches in a definite way, so that the white markings resulting as breaks between the reduced patches have become fixed and form a permanent part of the normal pattern.

"In several wild species this development of white markings is shown to be even now taking place, but the amount of pigment reduction is still fluctuating so that the white markings vary much in extent with different individuals.

"The development of such white markings takes place probably by little and little, so that the departure from type is not so great as to arouse antagonism against the varying individual on the part of others of its species. Also, the gradualness of the change allows the species to become accommodated to any disadvantage that might concomitantly arise.

"The converse of this centripetal style of pigmentation is present in many species, and results in pigmentation (commonly black) at the extremities or along lines where primary breaks occur in the centripetal form, namely, at the tip of the nose, ears, tip of the tail, or the toes; possibly the black dorsal stripe is due also to centrifugal pigmentation. Patterns may develop, as in certain antelopes, by a white break between patches of the two types."

Fitting logarithmic curves by the method of moments, J. R. MINER (*U. S. Dept. Agr., Jour. Agr. Research*, 3 (1915), No. 5, pp. 411-423).—In this paper, which includes an introductory statement by R. Pearl on the use of logarithmic curves in biological and agricultural investigations, the author attempts to im-

prove on the present method of fitting logarithmic curves by the least-squares method, by bringing this class of curves into the general system of curve fitting worked out by Pearson and known as the "method of moments." The method is worked out on the assumption that "if we equate the area and moments of a theoretical curve to the area and moments of a series of observations we shall get a reasonable fit of the curve to the observations."

A bibliography of 23 references is included.

[*Animal husbandry*], L. B. BARBER and J. B. THOMPSON (*Guam Sta. Rpt. 1914*, pp. 7, 8, 18-22, 25-27, pls. 3).—It is stated that the mating of a pen of single-comb Brown Leghorn hens with a native black-fleshed cock resulted in nine pullets which had dark green legs and black flesh, resembling in these features the male parent, and the remaining nine had dark green legs resembling the male parent, with white skin and flesh of a normal color resembling more closely that of the Brown Leghorn. From 23 cockerels out of the same breeding pen all had white skin and flesh resembling that of the Brown Leghorn, 20 had white legs, one had one white leg and one of a dark greenish hue, and the remaining two resembled each other in having one white leg with a black patch on the other leg. In this work a strong tendency is shown for the color characteristics to be transmitted by the parents to the progeny of the opposite sex.

In horse breeding experiments it has been demonstrated that foals from native mares and an imported stallion inherit size and quality from their superior sire, while they seem to retain in a full measure the hardiness and vitality of their native dams. Successful crossbreeding experiments with native hogs and imported Berkshires are reported.

It is stated that goats of an inferior and degenerate type which were probably introduced from Mexico are now bred on the Island. These have been occasionally crossed with a milch type, and the superiority of this cross over the native animal is well marked. It is stated that goats are reasonably hardy and free from disease in Guam, and a number of conditions exist which would indicate the adaptability of the milch goat, both in relation to the country and to the people.

The station flock of Plymouth Rocks and Brown Leghorns shows a tendency toward loss of vigor thought to result from inbreeding. Hens obtained from crossing either of the introduced breeds on the native fowl are reported to be better layers than the latter and with the hardiness of that parent not greatly reduced. In experiments with Brown Leghorn chickens, ordinary natives, native black meat fowls, and a cross between the latter and the Brown Leghorn, it was found that other things being equal all are equally susceptible to chicken pox.

Inoculation of ensiled roots with germ culture, ZSCHEYE (*Ztschr. Ver. Deut. Zuckerindus.*, No. 703 (1914), II, pp. 668-671).—Successful experiments are reported in inoculating ensiled roots with a lactic acid bacteria culture, resulting in a lowering of the injurious acids, acetic and butyric, as well as the ammonium nitrogen, the fermentation product of the protein material. The optimum temperature for growth of these bacteria appears to be about 35° C. The inoculated silage was of a clear color, with a clean sour smell, and in no case showed indications of spoiling, while the uninoculated silage was darker in color, showed indications of molding, and a decayed smell. In the inoculated silage there was a 24 per cent loss in the silage mass, in the uninoculated, 32 per cent.

Feeding of sugar-containing feed materials, ZUNTZ (*Ztschr. Ver. Deut. Zuckerindus.*, No. 701 (1914), II, pp. 485-498).—These were respiration experiments with ruminants, in which straw, molasses, turf molasses, and sugar

beets were fed in different proportions and the energy balance estimated. Also a comparison was made of the energy value of dried turnip tops and of ensiled turnip tops in which had been introduced a lactic acid culture, in which a greater amount of combustible gases developed in the body of the animals fed the ensiled product than the dried, the protein retention was greater with the dried product than with the ensiled, but the fat intake was greater with the ensiled product. The practical results of these experiments are summarized as follows:

The carbohydrates of molasses have a higher nutritive value for horses and swine than for ruminants, being highly usable by them. The degree of fermentation of the molasses is such that one should not feed much protein-rich feed, but such as is fed should be supplemented with a roughage feed. The organic acids of the feeds have a heat value. Reduction of the stomach fermentation with the feeding of acid or ensiled materials is doubtful.

New inquiries concerning the feeding of sugar-containing feed stuffs, ZUNTZ (*Ztschr. Ver. Deut. Zuckerindus.*, No. 703 (1914), II, pp. 643-668).—In this article the author reviews the work presented in the above experiments, showing wherein sugar-containing feeds, such as molasses and sugar beets, are an insufficient feed in themselves, giving rise to fermentation within the body and necessitating supplementing with straw, hay, and other roughage.

Calf- and pig-feeding experiments with whole milk and corrected skim milk, O. WELLMANN (*Landw. Jahrb.*, 46 (1914), No. 4, pp. 499-626).—In these experiments one calf and eight pigs ranging in age from four to twelve weeks were fed at different times on whole milk, skim milk to which diafarin (a malt extract preparation) had been added, skim milk to which a meal starch had been added, and homogenized milk. The coefficients of digestibility for the various rations were as follows:

Coefficients of digestibility with milks and various supplements.

Kind of animal.	Kind of ration.	Dry matter.	Protein.	Fat.	Nitrogen-free extract.	Ash.	Energy.
		<i>Per cent.</i>	<i>Per cent.</i>	<i>Per cent.</i>	<i>Per cent.</i>	<i>Per cent.</i>	<i>Per cent.</i>
Pigs.....	Whole milk.....	95.00	95.70	95.84	97.35	80.03	94.92
Calf.....	Diafarin + skim milk.....	81.76	75.38	-----	-----	-----	78.33
Pigs.....	Diafarin + skim milk.....	95.47	94.35	88.57	98.44	76.40	95.71
Pigs.....	Diafarin + 2.5 per cent fat skim milk.....	97.49	97.34	97.56	98.17	89.74	97.08
Pigs.....	Meal starch + skim milk.....	96.60	95.21	98.39	-----	82.63	96.23
Pigs.....	Homogenized milk.....	97.27	97.75	97.41	96.97	89.11	97.12

The daily increase in weight ranged between 2.5 and 3.1 kg. per 100 kg. live weight, the daily gain increasing with advancing age. There was required per kilogram of gain from 1.2 to 1.8 kg. of milk dry matter, 1.1 to 1.7 kg. digestible organic matter, 52 to 70 gm. digestible ash, 259 to 439 gm. digestible protein, 1.1 to 1.9 kg. starch value, and 5,000 to 9,000 available calories.

Steer feeding experiments (*Jahresber. Kaiser Wilhelms Inst. Landw. Bromberg*, 1913, pp. 18, 19).—Two lots of 17 head of steers each were fed daily during 5½ months, 1.7 kg. digestible protein and 12 kg. starch value per 1,000 kg. live weight. Both lots were fed hay, potatoes, beets, barley meal, rape seed, rye bran, and cotton-seed meal, but lot 1 received the potatoes, beets, and rye bran in the morning ration and the remainder at night, while lot 2 received the entire feed both morning and night.

Lot 1 made an average daily gain of 0.691 kg. per head, and lot 2, 0.735 kg. On continuing this experiment for another 4 weeks, except that the steers re-

ceived 13 kg. starch value per 1,000 kg. live weight, lot 1 made an average daily gain of 0.767 kg. per head, and lot 2, 0.777 kg.

Alfalfa silage for fattening steers, G. H. TRUE, F. W. WOLL, and V. F. DOLCINI (*California Sta. Circ. 124 (1915), pp. 4*).—With a view to determining the feeding value of silage made from first cutting alfalfa composed of at least half foxtail and weeds, 107 3- and 4-year-old native range steers weighing approximately 970 lbs. each were fed 46 days a daily ration of 10.6 lbs. alfalfa hay, 20.2 lbs. silage, and 8.4 lbs. rolled barley. They made an average daily gain of 1.53 lbs. per head, requiring per pound of gain 6.9 lbs. hay, 13.1 lbs. silage, and 5.4 lbs. barley.

The alfalfa was put into the silo about May 1 and feeding was begun in July. "The silage as fed out was well made, of a dark brown color, and of slightly acidulated, aromatic flavor. That in the lower part of the silo was more moist than that in the upper part and was apparently relished best by the steers. While most of the silage was not taken with particular relish, it was always eaten up clean, with the exception of a few days during the middle of July when a layer of partially spoiled silage was reached, at a point where the filling of the silo had been interrupted for a couple of days. The foxtail heads, which would have caused great trouble in feeding the alfalfa as hay, were eaten before having a chance to dry out."

The chemical composition of the alfalfa silage was found to be moisture 76, protein 3.4, fat 0.34, nitrogen-free extract 11.72, fiber 5.56, and ash 2.98 per cent, with 0.4 per cent of volatile acids and 0.91 per cent of fixed acids.

An examination of the carcasses after slaughter showed accumulations of foxtail in the mouths of practically all the steers, which emphasizes the necessity for cutting the alfalfa for silage before the foxtail beards become hard.

Prickly-pear experiments, E. W. HORN (*Dept. Agr. Bombay Bul. 58 (1913), pp. 11, pls. 10*).—Six bullocks in exceptionally poor condition were fed the common variety of prickly pear found in Bombay, from which the spines had been removed by burning and which had been cut into small pieces. About 6 lbs. of cotton seed per 100 lbs. of pear was included in the ration to make it sufficiently nutritious. Four of the bullocks took to the pear readily, while some difficulty was experienced with the remainder.

The pear feeding appeared to affect the excrement, making the feces of a slatish color and rather liquid, though at no time was there a tendency to scour. The urine was somewhat excessive in quantity but appeared quite normal in quality. The bullocks after a short time steadily gained in weight until a maximum was reached, after which the weights were practically constant. The average quantity of pear consumed was 32 lbs. per head per day, or about 72 lbs. per 1,000 lbs. live weight, varying as the pear contained more or less moisture. Assuming the coefficient of digestibility to be 66 per cent it is estimated that this allowance gave a maintenance ration, being only deficient 0.58 lb. of carbohydrate according to Haecker's standard. It is stated that as the weights of the animals increased their appearance improved, their coats becoming smooth and glossy, their eyes bright, and their health and general appearance excellent.

Very little water was needed by the bullocks while on the pear feed, although with the addition of 2 oz. of salt they drank a normal quantity.

Feeding tests with cows and buffaloes in milk were inconclusive. The composition of the pear during the dry season is given as follows: Moisture 79.32 per cent, protein 0.68, fat 0.78, carbohydrates 11.61, fiber 2.48, and ash 5.13; during the wet season, 92.65, 0.31, 0.22, 4.37, 0.85, and 1.6, respectively.

It is concluded that the pear may be used as an efficient and economical feed for cattle during periods of drought and feed shortage.

Feeding experiments with ensiled and dried beet pulp, O. MOSER (*Monatsh. Landw.*, 7 (1914), No. 7, pp. 153-158).—Oxen fed for from 174 to 200 days on beet pulp, dried and ensiled, together with hay and grain, showed a daily gain of 1.04 kg. per head on the ensiled product, 0.83 lb. gain where the ensiled and dried material was fed half and half, and 0.76 lb. gain on the dried product.

[Digestibility of Wyoming-grown hays], F. H. HEPNER (*Wyoming Sta. Rpt.* 1914, p. 147).—In experiments to determine the digestibility of pure native hays the following coefficients were obtained with sheep:

Digestion coefficients of Wyoming-grown hays fed to sheep.

Kind of hay.	Dry matter.	Organic matter.	Protein.	Ether extract.	Nitrogen-free extract.	Crude fiber.
	<i>Per ct.</i>	<i>Per ct.</i>	<i>Per ct.</i>	<i>Per ct.</i>	<i>Per ct.</i>	<i>Per ct.</i>
<i>Juncus balticus</i>	67.45	68.55	72.33	49.39	66.12	72.29
Do.....	66.48	67.95	74.98	49.51	56.66	70.06
<i>Bromus inermis</i>	63.41	65.06	74.66	52.56	64.87	61.86
<i>Agropyron pseudorepens</i>	67.35	69.25	76.08	56.41	71.10	64.62
<i>Poa nevadensis</i>	61.55	63.79	62.20	42.73	59.75	70.98
<i>A. occidentale</i>	63.63	65.31	74.15	52.92	62.43	67.99
<i>Eleocharis palustris</i>	68.51	70.99	64.06	50.26	69.95	75.84
<i>Carex utriculata</i>	62.13	67.63	63.48	52.55	65.80	72.84
<i>C. nebraskensis</i>	61.12	63.16	59.69	32.40	63.28	66.57

Uses of screenings, J. R. DYMOND (*Ann. Rpt. Ontario Agr. and Expt. Union*, 35 (1913), pp. 64-66).—It is stated that screenings are used in large quantities for the winter feeding of sheep, the sheep being taken from the range and fed for about 30 days. At first they are given only hay, then a small quantity ($\frac{1}{2}$ lb. per day) of light, chaffy screenings is added. Gradually the quantity is increased until in about a week or 10 days, the sheep have access to the "self feeders" from which they eat all the screenings they care for (about 2 lbs. per day). At the same time the proportion of chaff in the screenings is decreased and the proportion of grain increased. Gradually the screenings are replaced with corn.

On the screenings the sheep usually gain from 12 to 15 lbs. during the first 30 days, after that less rapidly. It is stated that 50,000 sheep will eat about 2 cars of screenings and a car of corn per day. Seed-house screenings and screenings containing a large proportion of broken flax are avoided.

Another use that is made of elevator screenings is in the manufacture of mixed feeds, chiefly molasses feeds.

Report of the wool specialist, J. A. HILL (*Wyoming Sta. Rpt.* 1914, pp. 162-165).—It is reported that "the results of an experiment in which 20 wethers were exchanged, ten natives of Ohio to Wyoming and ten natives of Wyoming to Ohio, show that a given sheep is likely to produce at least as much wool per year in Wyoming as in Ohio.

"The results of a 3-year experiment in which 30 Rambouillet wethers were divided into three lots of ten each and fed so as to test the effect on the wool production of the feeding without change for a year, respectively, of a wide, medium, and narrow ration, showed that the narrow ration tended to give greater wool production than either the medium or the wide." The rations were made up as follows for a lot of ten sheep: Wide, native hay 36 lbs.; medium, native hay 30 lbs., and oil cake 3 lbs.; narrow, native hay 20 lbs. and oil cake 8 lbs.

It was found from fiber tests made of the several samples that "the wide-medium-narrow ration experiment shows no decided advantage in strength of wool grown during the feeding of any one of the three rations. The Wyoming-

Ohio exchange experiment shows no apparent advantage in strength for wool grown in either State."

The policy in respect to the sheep industry, T. R. ARKELL (*Agr. Gaz. Canada*, 1 (1914), No. 7, pp. 546-549, figs. 3).—It is stated that the methods of assisting sheep raisers used by the live-stock branch of the Canadian Department of Agriculture are "(1) the loaning of pure-bred sires to associations of farmers living in districts where it is difficult to obtain first-class animals or where their financial status is such that they can not afford to pay the necessary purchase price, (2) provision of the services of expert wool graders to classify and prepare in a marketable condition the wool of mutual organizations of sheep raisers, (3) prosecution of instructional and practical demonstrations by experts of the branch in the various phases of sheep husbandry, with special stress upon the most effective methods of caring for wool, which are supplemented by an exhibit containing samples of many types of wool raised in this and other countries, together with their products of manufacture."

A table is given showing the correlation of American, British, and Canadian grades of wool and their distinctive terms. There is also included a complete classification of Canadian wool.

The Maryland hog (*Maryland Sta. Bul.* 185 (1914), pp. 58, figs. 27).—This includes a discussion by C. L. Opperman of the status of the swine industry in Maryland, and of methods of housing, feeding, care, and management of hogs and the curing of pork, and a description of the various types and breeds by R. H. Ruffner.

Fattening and improving the hog, N. P. ESCOBAR (*Estac. Agr. Expt. Ciudad Juárez, Chihuahua, Bol.* 43 (1913), pp. 41, pls. 7).—This is a general bulletin treating of the different breeds of hogs and their adaptability to Mexican conditions, together with a discussion of methods of fattening and of butchering.

Stallion enrollment.—II, Stallion service liens and sale of bred mares, D. O. THOMPSON (*Indiana Sta. Circ.* 45 (1914), pp. 4, fig. 1).—This circular gives the text of the sections of the Indiana stallion enrollment law relating to stallion service liens and the sale of mares and foals, with a brief discussion of them.

Stallion enrollment.—III, Report of stallion enrollment work to date of October 31, 1914, with lists of stallions and jacks enrolled and a brief study of some phases of the stallion and jack situation in Indiana, D. O. THOMPSON (*Indiana Sta. Circ.* 46 (1914), pp. 355, figs. 19).—This circular gives the text of the Indiana law relating to the enrollment of stallions and jacks kept for public service; a report on work under the law; and lists showing the distribution of stallions and jacks by counties.

Stallion enrollment.—III, Renewals for 1915, D. O. THOMPSON (*Indiana Sta. Circ.* 47 (1914), pp. 4).—This circular explains the methods for veterinary examination of public service stallions and the renewal of enrollment.

Which stallion and why? (*Kansas Sta. Circ.* 42, pp. 4).—This circular is intended as a stimulus to the raising of better horses in Kansas. It discusses the importance of the use of a superior stallion during the breeding season and gives a list of registered stallions.

Relation of simultaneous ovulation to the production of double-yolked eggs, MAYNIE R. CURTIS (*U. S. Dept. Agr., Jour. Agr. Research*, 3 (1915), No. 5, pp. 375-385, pls. 7).—This is a continuation of work previously noted (*E. S. R.*, 31, p. 170). The author summarizes her observations as follows:

"Double-yolked eggs with normal separate yolks may have all the egg envelopes common to the two yolks, or they may have some separate and some common envelopes. They may be classified with reasonable accuracy into three groups:

(1) Double-yolked eggs having the entire set of egg envelopes common to the two yolks; (2) double-yolked eggs having separate chalaziferous layers but all or part of the thick albumin common to the two yolks; (3) double-yolked eggs in which the yolks have entirely separate thick albumin envelopes but a common egg membrane and shell.

"Of the eggs studied 16.03 per cent belonged to type 1, 70.99 per cent to type 2, and 12.98 per cent to type 3. A large series of double-yolked eggs show all gradations within and between these groups. The most probable interpretation of this phenomenon is that the two components unite at any level of the oviduct from the funnel mouth to the isthmus ring. The conclusion that the union of the component eggs occurs indiscriminately at all levels of the oviduct is strongly supported by the fact that the percentage of eggs of each type is closely proportional to the percentage of the portion of the duct in which the union of two eggs would give double-yolked eggs of that type.

"In 36.44 per cent of the double-yolked eggs the ovulations which furnished the two yolks must have been separated by an abnormally short interval, since a normal egg had been laid on the preceding day. An examination of the egg structure, however, shows that the two yolks have passed the entire length of the duct together in only 16.28 per cent of the cases in which the ovulations are known to have been usually rapid. While a heightened rate of fecundity may result in the production of an egg of any of the three types, 68.75 per cent of the eggs of type 3 are single eggs. It seems probable that many of them have resulted from the delay of the first egg in the oviduct. The ovary of each pullet which had just laid a double-yolked egg as her first egg contained two normal separate follicles which had separate blood supplies. In these cases, however, the doubling of the egg had occurred near the end of the albumin-secreting region.

"In a case in which there was evidence from the structure of the egg that the two yolks had passed the entire length of the oviduct together the two follicles were also quite distinct, with separate blood supplies. This, together with the fact that in only a small percentage of double-yolked eggs is there any evidence of simultaneous ovulation, indicates that the fusion of follicles and a resulting common blood supply is by no means the usual cause for the production of a double-yolked egg. A simple normal follicle furnished the yolk with two germ disks; hence, the fusion of the oöcytes (if this was the origin of the two germ disks) must have occurred before the formation of the follicle."

From these observations it is concluded "(1) that double-yolked eggs sometimes represent a heightened rate of fecundity and sometimes an abnormally low physiological tone of the oviduct, (2) that even in cases in which the rate of fecundity is high the ovulations are not always simultaneous, (3) from the above it is apparent that the production of a double-yolked egg can seldom be explained as a result of simultaneous ovulations, and (4) in cases in which we have the best of reasons for suspecting simultaneous ovulations the two follicles may be quite distinct.

"It seems quite possible that a heightened rate of fecundity may result in every conceivable shortening of the period between ovulations consistent with the daily rhythm in the general physiological activities of the bird. Whether it results in the formation of a double-yolked egg is no doubt determined by the actual length of the period and the following response of the oviduct."

Crooked breast in fowls, C. D. STEWART (*Ann. Sci. Bul. Roy. Agr. Col. Cirencester, No. 4-5 (1912-13), pp. 97, 98*).—Investigations on this subject were made with the object of testing the effect of inbreeding.

It is concluded that "heredity seems ruled out as a cause of crooked breast, for all the chickens appeared perfectly normal when 10 weeks old, even though they were bred from stock selected with crooked breasts for three consecutive seasons." The results indicate that "perching is the chief, and probably the sole cause of crooked breast, and it seems to matter little whether the perches are round or square, large or small."

DAIRY FARMING—DAIRYING.

The production and consumption of dairy products, E. MERRITT (*U. S. Dept. Agr. Bul. 177 (1915), pp. 19*).—This bulletin outlines the changes in the geographic distribution of the dairy industry since 1870 and gives information concerning the consumption of dairy products on farms and in cities.

Census data are presented which show that the number of dairy cows increased from 9,000,000 in 1870 to nearly 21,000,000 in 1910. The total butter production increased from 514,000,000 lbs. in 1870 to 1,620,000,000 lbs. in 1910; cheese production from 163,000,000 to 321,000,000 lbs. When geographic divisions are considered individually the increase for those east of the Mississippi River has not been so rapid as the increase for those west of that river, due primarily to the undeveloped condition of the West prior to 1870.

The number of cows per 1,000 population was 224.3 in 1910 and 225.5 in 1900; the average production of butter per capita was 17.6 lbs., which was a decrease of 2 lbs. as compared with the production in 1900; the average production of cheese per capita was 3.5 lbs., which was 0.4 lb. less than the production in 1900. In butter production the greatest per capita output is in the North Central divisions followed by the Pacific division. The greatest per capita cheese production is in the East North Central division followed by the Middle Atlantic and Pacific divisions.

From replies to inquiries sent out to crop correspondents, it is estimated that the average person in a farm household consumes about $\frac{3}{4}$ qt. of milk per day, or a total yearly consumption of nearly 8,000,000,000 qts. for all farms reporting dairy cows. The daily butter consumption is $\frac{1}{16}$ lb. per person, and the total yearly consumption of farm families nearly 900,000,000 lbs.

The average number of quarts of milk required to make a pound of butter is estimated to be 9.6, varying from 8.1 to 10.7.

From replies furnished by boards of health it is estimated that the average per capita milk consumption in cities of 2,500 inhabitants or over is 112 qts. per year, and was slightly higher in cities of 25,000 inhabitants or over than in smaller cities. There was apparently less variation in milk consumption by months in the large cities than in the smaller ones. The fluctuations were generally less than 10 per cent.

International Union of Municipal Dairies (*Molk. Ztg. [Hildesheim], 28 (1914), No. 49, pp. 941, 942*).—An account of the first general meeting of the recently founded International Union of Municipal Dairies held in conjunction with the Sixth International Dairy Congress at Berne, June, 1914. Stockholm was selected by the meeting as the headquarters of the Union, which has for its object the general advancement of municipal dairying and the advising of its members as to methods of improving their business.

Value of vetch hay for milk and beef production, T. WIBBERLEY (*Jour. Bd. Agr. [London], 21 (1914), No. 8, pp. 707, 708*).—It is reported that for winter milk production, a daily ration consisting of 14 lbs. oat and vetch hay, 14 lbs. meadow hay, and from 70 to 84 lbs. giant rape or hardy greens was equal to 21 lbs. meadow hay, 56 lbs. roots, 3 lbs. corn meal, and 3 lbs. de-

corticated cotton cake. Methods of caring for the oat and vetch hay are described.

Palmnut kernel cake, J. A. MURRAY (*Jour. Bd. Agr. [London]*, 21 (1914), No. 8, pp. 697-701).—Methods of manufacturing this product are described and its composition and utility value for feeding purposes discussed. It is said that for feeding milch cows, palmnut kernel cake is a very good substitute for linseed cake. Cows may receive up to 5 lbs. per head per day.

Prolificacy of [the Guernsey] breed (*Guernsey Breeders' Jour., n. ser.*, 7 (1915), No. 2, p. 17).—It is stated that of over 3,500 yearly official records that have been made by cows of the Guernsey breed, 39.6 per cent were made by heifers with their first calves, the average production being 8,641.91 lbs. of milk and 432.28 lbs. of milk fat, with an average percentage of fat of over 5. It was found that 310 cows had produced over 560 lbs. of milk fat, and 63 over 700 lbs. The greater proportion of these records were made after the cows had carried their calves four or five months, which fact is brought forward to refute any claims made against the breed regarding the fecundity of the high producers.

Comparative investigations into the performance of the breeds of cattle kept in the Province of Saxony, Prussia, H. EBBINGHAUS (*Deut. Landw. Tierzucht*, 17 (1913), Nos. 40, pp. 473-476; 41, pp. 490-493; *abs. in Internat. Inst. Agr. [Rome]*, Mo. Bul. Agr. Intel. and Plant Diseases, 5 (1914), No. 1, pp. 99-101).—In comparing the Simmental with the Lowland breeds of cattle it was found that with the former the live weight and gain in weight at the same age are the greater, that the yearly yield of milk is lower than in the Black- and Red-spotted Lowland cattle, but higher than in the Harz and cross-bred animals, that the fat content and the quantity of fat produced are greater than in the other breeds, and that the food consumption if expressed in Kellner's starch-values is essentially the same as in the other breeds. The relative milk yield is lower, but the milk-fat yield and increase of live weight are greater than in the other breeds.

Profitable and unprofitable cows, G. E. WOLCOTT (*Maryland Sta. Bul.* 187 (1914), pp. 115-134, figs. 10).—From records kept for the past three years of three Maryland cow-testing associations comprising more than 1,100 cows it is found that "the first year's records show that there was a wide variation in production between the individuals of the herd; some made large yields, while others were kept at a loss or barely paid for their feed. The records for the second year prove that by disposing of low producing cows, the average production of the herd was increased. In a number of herds increased production was brought about by feeding the individuals of the herd according to their ability to produce milk and fat. This was the case in herds where no abnormally low producers were found.

"The high producing cows were the most profitable. . . .

"When the production of the individuals in the herd was known, the members of the associations were able to save the heifer calves from the best cows. One year's record work is not sufficient. When the herd has reached a high average of production constant selection is necessary to maintain this average.

"The association in Harford County shows a higher average production of butter fat than the other associations. This is due to the fact that several large herds of pure-bred cattle have been kept in the county for many years, and the pure-bred bulls from these herds have been used freely."

Testing and handling of milk and cream, R. McCANN (*Colorado Sta. Bul.* 202 (1914), pp. 3-31, figs. 27).—This bulletin describes the methods and equipment used in the testing of milk and cream, and other matters relating to the

care and handling of cream. The procedure under the State laws relative to licenses, examinations, and inspections is also explained.

The encouragement of clean milk production, L. B. COOK (*Mass. Bd. Agr. Circ. 38* (1915), pp. 9).—The author contends that the production of clean milk may be most readily encouraged by obtaining for the milk producer a reasonable margin of profit. It is shown that the average price paid for milk has not kept pace with the increasing cost of feeding stuffs. The grading of milk and the paying of prices according to grade would be an inducement along this line.

Ability of colon bacilli to survive pasteurization, S. H. AYERS and W. T. JOHNSON, Jr. (*U. S. Dept. Agr., Jour. Agr. Research, 3* (1915), No. 5, pp. 401-410, fig. 1).—The authors summarize the results of their studies, which are a continuation of work previously noted (*E. S. R.*, 29, p. 73), as follows:

"The thermal death point of 174 cultures of colon bacilli isolated from cow feces, milk and cream, human feces, flies, and cheese showed considerable variation when the cultures were heated in milk for 30 minutes under conditions similar to pasteurization. At 60° C. (140° F.), the lowest pasteurizing temperature, 95 cultures, or 54.59 per cent, survived; at 62.8°, the usual temperature for pasteurizing, 12, or 6.89 per cent, survived. One culture was not destroyed at 65.6° on the first heating, but in repeated experiments it was always destroyed. There is a marked difference in the effect of heating at 60° and at 62.8°. Although there is only a difference of 2.8°, 87.3 per cent of the cultures which survived at 60° were destroyed at 62.8°.

"Considerable variation was found in the thermal death point of the colon bacilli which survived 62.8°. When the 12 cultures which survived were heated again at the same temperature, it was found that many did not survive and in each repeated heating different results were obtained. It seems evident that 62.8° maintained for 30 minutes is a critical temperature for colon bacilli. Among the 174 cultures studied all were found to have a low majority thermal death point, but were able to survive pasteurizing temperatures on account of the survival of a few cells.

"The colon test as an index of the efficiency of the process of pasteurization is complicated by the ability of certain strains to survive a temperature of 62.8° for 30 minutes and to develop rapidly when the pasteurized milk is held under temperature conditions which might be met during storage and delivery. The presence of a large number of colon bacilli immediately after the heating process may indicate improper treatment of the milk. If milk is pasteurized at a temperature of 65.6° or above for 30 minutes, we should not expect, from our results, that any colon bacilli would survive. Consequently under such conditions the colon test for the efficiency of pasteurization may be of value. It must be remembered, however, that a study of more cultures may reveal strains of colon bacilli that are able to survive this and even higher temperatures."

A bibliography of cited literature is appended.

A bacteriological study of blue milk, B. W. HAMMER (*Iowa Sta. Research Bul. 15* (1914), pp. 467-481, figs. 7).—This is an account of a bacteriological study made of a sample of blue milk coming from a small Iowa farm, but which is thought to have become infected in the home of a customer.

Careful study of the organism involved proved it to be *Bacillus cyanogenes*. The organism isolated was examined morphologically, culturally, and biochemically. In its action on milk the organism was found to "produce a color in raw milk, in pasteurized milk, and in sterilized milk, although the color produced was markedly influenced by the previous treatment of the milk.

"Raw milk invariably developed a color sooner than pasteurized or sterilized milk and the color was also a brighter blue as a rule, being in some cases a sky

blue. Pasteurized milk inoculated with the organism developed a more intense color than sterilized milk, and in some cases (apparently influenced largely by the organisms surviving pasteurization) the color developed approximated that developed in raw milk. It was noticed that pasteurized milk which curdled quite rapidly, due to the production of acid, gave a good color development as a rule. In sterilized milk the color production was poor and is best described as a bluish gray rather than as a blue. In milk to which glucose was added before sterilization the color produced was more intense than in ordinary milk."

An increase in the intensity of the color was accompanied by an increase in acidity. The addition of *Bacterium lactis acidii* to milk cultures of the blue milk organism (either freshly inoculated or a number of days old) resulted in a great increase in the intensity of the color.

"In no case was it possible to produce a blue color in milk held at 37° C. [98.6° F.], no matter what the previous treatment of the milk had been. The same temperature influence was found to hold for the various bouillons and it seems that the higher temperatures are unfavorable to the production of color. No attempt was made to determine the lowest temperature which would prevent the formation of color, but both room temperature and 20° allowed the rapid production of color."

Pasteurization as well as sterilization favored the production of color uniformly throughout the sample, while in raw milk the color was in the main present only at the surface. Color production was found to occur in skim milk, in whole milk, and in cream, and in all cases the color production was greatest at and near the surface in the raw material. Attempts to produce a blue color in pieces of old cheese by the inoculation of the organism from agar slopes were unsuccessful.

A historical sketch of investigations of this organism is given, together with a bibliography of 12 references.

The use of *Bacillus bulgaricus* in starters for making Swiss or Emmental cheese, C. F. DOANE and E. E. ELDRIDGE (*U. S. Dept. Agr. Bul. 148 (1915), pp. 16, pl. 1, fig. 1*).—This bulletin reports experimental work showing how to control undesirable fermentations and thus to provide a remedy for the most serious troubles which occur in making Swiss or Emmental cheese.

Many cultures of *B. bulgaricus* obtained from different sources were used and found to vary widely in their ability to suppress gas-forming bacteria, some proving efficient when the starter was less than 2 per cent of the total amount of milk used, whereas other cultures were not efficient with less than 4 per cent. Ordinary lactic acid cultures were not successful in preventing gas formation. Experiments with *B. bulgaricus* starters in a commercial factory demonstrated that the maker of Swiss cheese can control the fermentations with some cultures of this organism; that a good quality of Swiss cheese can be made in winter as well as in summer; and that it is probably practicable to make cheese once a day instead of twice a day, as has been necessary in the past.

Methods are described for preparing and keeping cultures, and a new type of starter-can for carrying starter is illustrated and described. This starter-can may be used for other dairy purposes with whey starters.

Influence of the flora of the cheese rind on the proteolysis and fat-splitting in the inner portion of the cheese, O. GRATZ and I. SZANYI (*Kisérlet. Közlem., 17 (1914), No. 5, pp. 801-834, figs. 16*).—From analyses of different portions of the cheese it was concluded that the flora of the outer portion do not participate in the proteolysis and fat-splitting of the inner portion.

VETERINARY MEDICINE.

Synopsis of parasitology of man and the domestic animals, L. GEDOELST (*Synopsis de Parasitologie de l'Homme et des Animaux Domestiques. Lierre: Jos. Van In & Co., 1911, pp. XX+332, figs. 327*).—The first part of this work deals with the vegetable parasites (pp. 1-29). The animal parasites are taken up under the headings of Protozoa (pp. 30-64), worms (pp. 65-139), and arthropods (pp. 140-252). Brief descriptions are given of the genera and higher groups of which the parasitic species are listed. Host lists of parasites are given for man, horse, ass, mule, cattle, carabao (*Buffelus indicus*), zebu (*Bibos indicus*), elephants (*Elephas indicus* and *E. africanus*), camels (*Camelus bactrianus* and *C. dromedarius*), reindeer (*Tarandus rangifer*), sheep, goat, swine, dog, cat, guinea pig, rabbit, chicken, turkey, guinea fowls (*Numida meleagris* and *N. ptilorhyncha*), pheasant, pigeon, peacock, duck (*Anas boschas domestica*), goose (*Anser cinereus domesticus*), swan, and ostrich.

A complete index is included.

Handbook of veterinary obstetrics, L. FRANCK (*Handbuch der tierärztlichen Geburtshilfe. Berlin: Paul Parey, 1914, 5. rev. and enl. ed., pp. X+740, figs. 335*).—This work deals with anatomy, physiology, and pathology as related to gestation and parturition, diseases that follow, diseases and abnormalities of the young, etc.

Regulations governing the meat inspection of the United States Department of Agriculture (U. S. Dept. Agr., Bur. Anim. Indus. Order 211 (1914), pp. 97).—The regulations here promulgated became effective November 1, 1914, with the exception of regulation 27, relating to the inspection of imported meats, which became effective January 1, 1915.

The new regulations codify the many amendments and rulings made since the adoption of the old regulations on April 1, 1908, and also add to the requirements a number of features suggested by eight years' experience in meat inspection and conforming with recent scientific discoveries. The more important changes made relate to the condemning of diseased animals prior to slaughter, withdrawal of inspection from inspected establishments that violate the regulations, the permission of the sale of second-class sterilized meat on a plan somewhat similar to that followed by the German and Austrian Governments, more stringent regulations governing the inspection of carcasses of hogs suspected of hog cholera, the safeguarding of inspection marks, prohibition of raw pork in certain food products, a redraft of sanitary regulations, and regulations regarding imported meat.

Guide for meat inspectors, R. OSTERTAG, trans. by E. V. WILCOX (*New York: William R. Jenkins Co., 1915, pp. 7+258, figs. 158*).—The first English edition, translated from the twelfth edition of the author's *Leitfaden für Fleischbeschauer*.

In an introduction the author discusses briefly the nature and purpose of ante-mortem and post-mortem inspection. The several chapters of the work take up the subject as follows: Name and normal character of organs and parts of animals, including the determination of the species from sample parts (pp. 3-51); functions of the animal body with special reference to the blood and lymph circulation and to the chief evidences of health in living animals (pp. 52-60); ante-mortem inspection, including the means of identifying animals (pp. 61-76); methods of slaughtering, cuts of meat, live and dressed weight, post-mortem changes in meat, and the recognition of the age and sex of slaughtered animals (pp. 77-92); routine of meat inspection (pp. 93-101); nature and characteristics of the diseases and defective conditions of most

Importance in meat inspection (pp. 102-195); preservation of meat—tanking of condemned meat (pp. 196, 197); legal regulation of meat inspection in the United States (pp. 198-240); and educational requirements for inspectors (pp. 241-254). All material not applicable to American conditions has been omitted. Some 80 pages relating to German laws, regulations, and diseases which do not occur in the United States have thus been replaced with American laws, regulations, and educational requirements for inspectors, and matter relating to diseases not discussed by the author. The most recent regulations of this Department governing meat inspection are noted above.

Handbook of meat inspection, R. VON OSTERTAG (*Handbuch der Fleischbeschau*. Stuttgart: Ferdinand Enke, 6. rev. and enl. ed., vol. 2, pts. 1 (1910), pp. XII+472, figs. 120; 2 (1913), pp. XVI+890, pls. 3, figs. 258).—The sixth revised and enlarged edition of this work (E. S. R., 16, p. 96).

Stock poisoning plants of California, H. M. HALL and H. S. YATES (*California Sta. Bul.* 249 (1915), pp. 219-247, figs. 7).—Among the more important poisonous plants here dealt with are the water hemlock (*Cicuta* sp.), death camas (*Zygadenus venenosus*), larkspurs (*Delphinium* spp.), milkweeds (*Asclepias* spp.), lupines (*Lupinus* spp.), loco weeds (*Astragalus* spp.), etc. A bibliography is appended.

Some observations on arsenical dipping fluids, L. COHEN (*Agr. Gaz. N. S. Wales*, 25 (1914), No. 11, pp. 937-944).—This paper discusses the preparation of standard dip fluid and the maintenance of standard strength.

[**First biennial report of the office of state veterinarian**], W. H. LYTLE (*Bien. Rpt. Oreg. Live Stock Sanit. Bd.*, 1 (1913-14), pp. 14-41).—This report deals with milk and meat hygiene; diagnostic serums; curative and preventive vaccines; and the various infectious diseases which occurred in Oregon during the year. Rabbit eradication is also briefly discussed.

Report of proceedings under the diseases of animals acts for the years 1912 and 1913 (*Dept. Agr. and Tech. Instr. Ireland, Rpt. Diseases Anim.*, 1912, pp. 55; 1913, pp. 63, pl. 1).—These annual reports (E. S. R., 27, p. 781) deal with the occurrence of the infectious diseases of domestic animals scheduled under the diseases of animals acts in Ireland. Much statistical data relating thereto are appended to the reports.

Determination of the protein content of the serum of domesticated animals by refractometry, G. CSONKA (*Közlem. Összehasonl. Élet es Kortan Köreből*, 10 (1913), No. 7-8, pp. 257-292, figs. 2; abs. in *Berlin. Tierärztl. Wehnschr.*, 29 (1913), No. 46, p. 820).—The refraction coefficient of the blood serum of sound animals is very variable, but between 1.345 and 1.35185. An abnormal increase in the refraction occurs when the animals receive too little water or lose much water, as in the dysentery noted in intestinal forms of hog cholera. An abnormally low coefficient is noted in cardiac and renal insufficiency, in anemic and cachectic conditions, especially in distomatosis of sheep.

The refraction is a sensitive method for detecting hydramnia. In heart diseases it is possible by the method to note the variation in the utilization of feed-stuffs by the circulating blood and also to determine the variation in velocity of the circulation. The cryoscopic method is preferable for determining the degree of renal insufficiency.

Anthrax or charbon.—Points of popular interest, H. MORRIS (*Louisiana Stas. Bul.* 152 (1915), pp. 3-11, figs. 3).—This bulletin answers in brief form questions regarding the nature and control of anthrax.

Foot-and-mouth disease (*Jour. Bd. Agr. [London]*, 21 (1915), No. 10, pp. 873-877, pls. 2).—A brief summarized account.

Dealing with foot-and-mouth disease, W. J. HARTMAN (*Breeder's Gaz.*, 67 (1915), No. 7, pp. 331, 332, figs. 9).—It is pointed out that while the disease

may not be fatal in communities where corn silage, roots, and other soft feeds can be fed, this is not true in the western States where cattle subsist on dry, hard feed through the winter. The author states that more than 30 of some 900 infected cattle died of the disease in the stockyards at Glendive, Mont., during the first 10 days' progress of the disease in November. In sheep and hogs, of which more than 200 of the former and about 30 of the latter were infected at Glendive, the disease was much more severe than in cattle.

A study of the specific reactions for the diagnosis of glanders, V. A. MOORE and C. P. FITCH (*Rpt. N. Y. State Vet. Col., 1911-12, pp. 51-69*).—Because of the discrepancy sometimes observed in the diagnostic tests it seemed necessary to make a careful investigation of the different methods and to determine so far as possible their relative value. The work was carried on with the cooperation of the New York State Department of Agriculture.

The discrepancies which are reported from different laboratories with the agglutination test for glanders are believed to be usually due to the test fluid used in one or the other laboratory. Thus it is that cultures isolated from different sources show a marked difference in their agglutinating properties, and, furthermore, some cultures that agglutinate satisfactorily later lose their agglutinating properties. There are also cultures of *Bacillus mallei* which will agglutinate with the serum from healthy horses. No advantage could be noted in using a test fluid prepared from several strains of *B. mallei*.

"The discrepancies which occur between the results of the sera and mallein tests can often be explained on the ground that the sera were taken from horses previously tested with mallein or treated with vaccine. Miessner [*E. S. R., 20, p. 385*] calls particular attention to the fact that when the agglutination test is used in the control of glanders the use of mallein should be prohibited. Our experience shows that the indiscriminate use of vaccines has an equally deleterious effect upon the accuracy of the sera tests."

In all probability different tests depend upon the presence of different specific antibodies or products given off by the tissues as the result of the stimulation of the tissues by the glanders organism. The bodies upon which the serum reactions depend do not appear to occur in the blood at the same time.

The complement fixation test "does not possess, because of the greater chance for error owing to its complications, any advantage over the agglutination test in diagnosing occult glanders." The ophthalmic mallein test has a definite value in the diagnosis of occult glanders and it can be used at times when the subcutaneous method is precluded. The subcutaneous method under suitable conditions is quite as accurate as the ophthalmic mallein test.

"As with the sera test, mallein can not be relied upon in the diagnosis of glanders in animals that have previously been injected with vaccine. In practice the use of mallein has this advantage, that it is a field method and the conditions governing the test and the interpretation of the reaction are left to the practitioner who is familiar with the case. Further, the elements of error are in proportion to the complications of the method. In confirmation of the results of positive reactions by means of post-mortem examinations it is very important not to mistake lesions caused by parasites for those of glanders. Olt has pointed out that parasitic lesions often occur in the lungs and liver which are easily mistaken for glanders nodules. The diagnosis can be made from a microscopic examination of the properly stained sections. In case of lesions due to parasites there is a varying degree of eosinophilia which is absent in glanders. In our experience we have found lesions of a parasitic nature in the lungs, liver, spleen, and lymphatic glands that resembled glanders macroscopically and which in several cases were supposed to be true glanders lesions."

The insect carrier and the reservoir of the virus of oriental sore.—**Hypothesis and preliminary experiments**, E. SERGENT, G. LEMAIRE, and G. SENEVET (*Bul. Soc. Path. Exot.*, 7 (1914), No. 7, pp. 577-579; *abs. in Rev. Appl. Ent.*, 2 (1914), Ser. B, No. 12, pp. 199, 200).—The authors have found that *Phlebotomus minutus africanus* not only feeds upon the gecko (*Tarentola mauritanica*) but also bites man. From 19.7 per cent of the geckos examined they have been able to prepare pure cultures of a *Leptomonas* which resembles that obtained from cultures of oriental sore (Biskra boil, tropical ulcer). References are given to the literature on the subject.

New serum and liver substances as levuloses in trypanosomiasis, K. SCHERN (*Jour. Med. Research*, 30 (1914), No. 3, pp. 533-540).—Previously noted from another source (E. S. R., 30, p. 381).

The value of physical examination and clinical diagnosis in the control of tuberculosis in cattle, V. A. MOORE (*Rpt. N. Y. State Vet. Col.*, 1911-12, pp. 169-175).—The author concludes that a physical examination will enable a skilled examiner to detect advanced cases of tuberculosis in cattle and the presence of lesions in less advanced cases so that the suspected animals can be removed. If properly carried out, it will also detect from 80 to 90 per cent of the animals which are actually spreading the virus and a large percentage of those about to become spreaders but which have not eliminated the specific bacteria. It will not, however, detect more than from 1 to 5 per cent of the infected animals at any one time, and can not be relied upon to detect all infected cattle. For this reason its value is very largely restricted to the intra-herd control of the disease, while in interherd control tuberculin is the only diagnostic agent we have.

The intrapalpebral and intradermic palpebral tuberculin tests, G. MOUSSU (*Rec. Méd. Vét.*, 91 (1914), No. 13, pp. 425-434, figs. 5; *abs. in Jour. Compar. Path. and Ther.*, 27 (1914), No. 3, pp. 265, 266).—The objections which may be raised to the use of the subcutaneous tuberculin test are discussed at some length. From the practitioner's standpoint are mentioned the amount of trouble involved in taking the temperatures; the possibility of noting temperatures incorrectly; the difficulty of interpreting irregular results; the necessity of keeping the animals indoors, which is in itself sometimes sufficient to cause a rise of temperature; the impossibility of applying the test to animals in a febrile condition; and the necessity of carrying out the test at certain hours at the risk of making serious errors. These are not objections to the method itself, but are due to conditions under which the test is carried out.

On the side of the owners of cattle the following objections may prevail: (1) A reduction in the milk yield; (2) danger of specific mastitis; and (3) danger of aggravating the general condition of the diseased animals. In view of these objections the local tests, intradermic and intrapalpebral, are considered more useful, more practical, and more economic from the owner's point of view and more remunerative than the subcutaneous method from the practitioner's point of view.

There is no difficulty in applying the test, provided a suitable syringe is used; "this should have a capacity of 1 cc. The needle should be about $1\frac{1}{2}$ cm. in length and 7 mm. in diameter. The barrel of the syringe should be graduated into tenths, and the piston rod should have a traveling stop on it. It is advised that 0.1 cc. of ordinary tuberculin should be used, special tuberculin of any kind not being required.

"When the test has been properly carried out a little swelling should be formed in the subepidermic tissue, about the size of a large lentil, where the tuberculin is injected. Reactions are said to make their appearance more rapidly and more clearly the more recent and the more limited the lesions.

After 36 to 48 hours the eyelid becomes swollen, edematous, and slightly tense, and the eye appears sunken. The tissues lose their suppleness, the skin is rigid and sometimes reddish and moderately sensitive. There may be slight lachrymation. Even a moderate reaction is rendered quite obvious by comparison with the opposite eye.

"When the palpebral and caudal tests are carried out simultaneously they agree exactly, and should one of the tests have been improperly carried out the other gives a positive result. An important practical point is that the tests are complementary, or they correct each other. For those who find the intradermic palpebral test too delicate a manipulation, a subcutaneous injection of $\frac{1}{2}$ to $\frac{1}{2}$ cc., or more, of tuberculin may be made into the upper or lower eyelid, this yielding a local reaction as characteristic as the intradermal test. The author has carried out tests upon about 60 animals, using different doses of tuberculin, and he has found that as good results can be obtained with $\frac{1}{2}$ cc. as with $\frac{1}{2}$ cc. If, however, the larger dose be used, the test approximates to the subcutaneous method in that it is likely to produce a temperature reaction with the accompanying disadvantages. The method of testing is held to be free from all the objections that have been raised above against the subcutaneous method."

The author's practice is to make an injection into both eyelids.

Avian tuberculosis, F. S. JONES (*Rpt. N. Y. State Vet. Col., 1911-12, pp. 159-164, pls. 5*).—A review of the literature with a history of a recent outbreak in New York State. The autopsical findings with a White Leghorn pullet are given in detail with reproductions of photographs of the affected organs.

Actinomycosis or lumpy jaw, R. R. DYKSTRA (*Kansas Sta. Circ. 41, pp. 3*).—A popular account.

Brisket disease (dropsy of high altitudes), G. H. GLOVER and I. E. NEWSOM (*Colorado Sta. Bul. 204 (1915), pp. 24, figs. 5*).—This is a preliminary report of studies of a disease which occurs in cattle at high altitudes in Colorado, the principal symptoms of which are swelling of the brisket and the loose tissues under the jaw, usually diarrhea, and a moist cough, with gradual emaciation and death. The disease which is chronic in character is fatal in practically all cases. On autopsy the most marked symptoms are general dropsy, enlarged and hard liver, and dilated heart.

Reports are presented of 31 cases under observation. Six cases which were shipped to a lower altitude (about 5,000 ft.) all recovered without other treatment, although it is believed that they would have died had they not been shipped.

"It appears to be caused by an exhaustion of the heart muscle associated with a varying degree of dilatation and hypertrophy and this being brought about by exertion before acclimatization at high altitudes, or in the case of calves, inherited cardiac weakness. Medical treatment has so far proved of little avail, but where possible shipping the affected animals to a lower altitude is recommended. Preventive measures include the use of bulls that have been raised at altitudes of 8,000 ft. or more, with a view to building up a hardier strain of cattle, also the curtailment of indiscriminate shipping of low altitude cattle to high altitudes."

[A disease of cattle reported in Guam which resembles Texas fever], J. B. THOMPSON (*Guam Sta. Rpt. 1914, pp. 22-23, figs. 3*).—This is a report of further studies (E. S. R., 31, p. 482) of a disease of cattle reported in Guam.

It is stated that all the imported cattle have again been subject to attacks of fever at various times during the year. Several affected animals succumbed to the disease. The principal symptoms observed in a cow which succumbed March 8 were extreme emaciation, a depraved appetite, and a more or less inter-

mittent fever. A post-mortem examination showed lesions indicative of Texas fever. Temperature charts of three animals are presented.

"The immunization of susceptible cattle from the United States by the method of controlling tick infestation has not proved complete or reliable, but results in what appears to be a chronic form of the disease. In the introduction of cattle into Guam the great importance of securing immune stock is plainly recognized."

Diseases of swine, S. S. BUCKLEY (*Maryland Sta. Bul. 185 (1914), pp. 59-67*).—A brief summarized account is given of the diseases of swine most commonly met with in Maryland.

Hog cholera, L. L. LEWIS, W. P. SHULER, C. H. McELROY, and L. B. RITTER (*Oklahoma Sta. Bul. 104 (1914), pp. 30, figs. 10*).—Following a general statement relative to hog cholera in Oklahoma and a description of the disease and its distribution, the findings on post-mortem, and methods of producing and using antihog-cholera serum, some experimental data collected during routine work in this branch are reported.

Examinations of the blood showed that in uncomplicated cases of hog cholera there is a general tendency toward a reduction of red and white blood cells and in the amount of hemoglobin. In one case the erythrocytes were reduced from 5,740,000 to 2,000,000 per cubic millimeter in 12 days as a result of inoculating virus and a reduction of the leucocytes from 25,000 to 7,000 per cubic millimeter. In some observations on the changes produced in the blood by hyperimmunizing with the slow or subcutaneous method and successive bleedings from the tail at intervals of from 8 to 12 days, it was found that the "introduction of the virus appears to lessen very materially the red cell count, but does not affect the leucocytic count to the same extent. The amount of blood taken at each bleeding was approximately 750 cc. (6 cc. per pound of weight)." Neither the leucocytes nor the percentage of hemoglobin appears to be affected to a marked degree by the process. In studying the effect of the intravenous method of inoculation the data show "that there is a reaction in from one to four days after immunizing, the temperature rising from 1 to 5° F. There does not appear to be any marked effect on the percentage of hemoglobin. The white blood corpuscles are increased in each case after the injection of the blood, and as a rule a slight rise in the number of red cells will be noted."

Quinin hydrochlorate was studied as regards its influence on the course of hog cholera. "So far as the four cases studied are concerned, quinin in the amounts given failed to influence the course of the disease, but did appear to have some effect on the period of incubation. The blood count in these cases was variable, but the general tendency of all the hogs was to show a lower count toward the termination of the disease. Temperatures were variable and did not show any effect of the administration of the quinin solution. Quinin hydrochlorate was administered hypodermically in 14.3-grain doses. All of the pigs were killed as their physical condition indicated that death would occur within a short time." A few cases showing the effect of intravenous injections of cold physiological salt solution and a large amount of vaccine in one case are also reported upon.

"Experiments were conducted in connection with the hog cholera serum work to determine the time after hyperimmunizing before the blood from the hypered or treated hog ceases to be virulent to normal hogs. The test was planned so that checks could be had on the virulence of blood used for hypering and to keep the test pigs in pens free from any outside infection. . . . The result of one of the tests shows that blood drawn 24 hours after hypering does not contain virulent material; also that the blood drawn after four or five days is not sufficiently potent as a vaccine to be relied upon to protect a hog

when given in the usual amount against a fatal dose of virus administered later." In other experiments it was planned to use the blood from a pig which had been hyperimmunized for two days in the same manner as a vaccine was used. "The pig was hyperimmunized by giving 5 cc. of virus per pound of weight; weight of pig about 60 lbs. The blood was injected intravenously, and 42 hours later the pig was killed and the blood secured was treated as vaccine; that is, it was defibrinated and had 0.5 per cent carbolic acid added as a preservative." This blood tested on four healthy pigs showed no ill effects even though they were given 1 cc. of fresh hog cholera virus nearly a month later. In giving virus intravenously it was found best to cool it to near the freezing point. This causes in some cases a rise in body temperature and in others a reduction.

Analyses made of the urine of hogs during the course of immunization by the intravenous route indicated very little variation from the normal composition. In one instance albumin was noticed and indican was found in several cases.

Serum as a factor in inter-herd control of hog cholera in New York, R. R. BIRCH (*Rpt. N. Y. State Vet. Col., 1911-12, pp. 131-139*).—A brief discussion of the serum and serum simultaneous method of treatment, the factors instrumental in spreading hog cholera in the State, especially the feeding of garbage, and the desirability of permanent immunity in hogs.

It is pointed out that "serum treatment is a valuable aid to sanitation, but is not a substitute for it. Conditions in New York suggest that the sooner active measures are taken to suppress hog cholera the cheaper and more effective these measures will be." "Correct diagnosis is important. Especially must the disease be differentiated from food poisoning."

Notes of the hog cholera conference at Purdue University, December 18, 1913, C. H. CLINK (*Indiana Sta. Circ. 48 (1915), pp. 27, fig. 1*).—A detailed account of the meeting, including the questions asked and the answers given.

Report of veterinarian, C. A. CARY (*Alabama Col. Sta. Rpt. 1914, pp. 17, 18*).—In the work carried on during 1914, particular attention was given to the kidney worm (*Stephanurus dentatus*). It was found in the kidneys, kidney fat, and lumbar muscles in every hog that was examined which had paraplegia. It is stated that at present no remedy can be given that will eliminate these worms from the affected parts.

New pig disease in Ireland, W. FROST (*U. S. Dept. Com., Com. Rpts., No. 19 (1915), p. 333*).—A disease of swine known locally as "purple fever" which recently appeared in Mayo and Sligo Counties, Ireland, is thought to be a form of swine erysipelas.

Canine medicine and surgery, C. G. SAUNDERS (*Chicago: Amer. Jour. Vet. Med., 1915, pp. 249, figs. 8*).—A work intended mainly for the use of senior students and practitioners of veterinary medicine. It presumes a knowledge of pathology, histology, and anatomy, and aims to deal only with the clinical aspect of the various diseases. The first part (pp. 7-179) deals with diseases; the second part (pp. 180-242) with surgical operations.

Infectious coryza of fowls, G. VALLILLO (*Clin. Vet. [Milan], Rass. Pol. Sanit. e Ig., 37 (1914), No. 3, pp. 93-111, figs. 2; abs. in Vet. Rec., 27 (1914), No. 1363, pp. 121, 122*).—This disease of fowls has prevailed for a number of years in the Lago di Lecco district of Italy. It takes the form of a catarrhal infection of the upper air passages, and in consequence of its high mortality, especially among the younger birds, causes considerable loss to poultry breeders. The disease is said to be caused by a short ovoid bipolar bacillus which is often united in chains of two or three together. To all appearances it is a variety of *Bacillus avisepticus*. As a rule the disease ends with death after a duration

of from six weeks to three months. Only adult, strong, and well-nourished birds recover without serious injury.

Coccidiosis in poultry and game birds, H. B. FANTHAM (*Jour. Bd. Agr. [London]*, 21 (1915), No. 10, pp. 889-899, figs. 2).—A summarized account, including preventive measures.

RURAL ENGINEERING.

Engineering geology, H. RIES and T. L. WATSON (*New York: J. Wiley & Sons*, 1914, pp. XXVI+672, pls. 104, figs. 225).—In an exposition of the fundamental principles of geology the authors have attempted primarily to emphasize the practical application of the topics treated to engineering work. The book begins with an extensive discussion of petrographic subjects, such as the properties of common rock-forming minerals and the general character, mode of occurrence, origin, structural features, and metamorphism of rocks. Considerable space is devoted to rock weathering, soil formation, and the occurrence, distribution, and movement of surface and underground waters. Other subjects more closely related to structural engineering which are taken up in more or less detail are landslides; wave action and shore currents; lakes; glacial deposits; building stone; limes, cement, and plaster; clay and clay products; coal; petroleum, natural gas, and other hydrocarbons; road foundations and materials; and ore deposits.

The principles of irrigation practice, J. A. WIDTSON (*New York: The Macmillan Co.*, 1914, pp. XXVI+496, figs. 179).—This popular treatise represents an attempt to develop the principles underlying the correct use of water in irrigation for the use of farmers. It contains the following chapters: The meaning of irrigation; soil moisture; the soil as water reservoir; saving water by cultivation; soil changes due to irrigation water; conditions determining the use of soil moisture by plants; the water-cost of dry matter; crop development under irrigation; the time of irrigation; the method of irrigation; crop composition; the use of the rainfall; irrigation of cereals; alfalfa and other forage crops and pastures; sugar beets, potatoes, and miscellaneous crops; fruit trees, other trees, and shrubs; the duty, measurement, and division of water; overirrigation and alkali; irrigation in humid climates; irrigation tools and devices; the history of irrigation; and permanent agriculture under irrigation.

Underground water resources of the Coastal Plain of Georgia, L. W. STEPHENSON, J. O. VEATCH, and R. B. DOLE (*U. S. Geol. Survey, Water-Supply Paper 341* (1915), pp. 539, pls. 21, figs. 4).—This report embodies the results of studies of the geology and underground water resources of the Coastal Plain of Georgia, the latter being discussed for each county in the area, including various analyses.

Geology and water resources of Tularosa basin, New Mexico, and adjacent areas, O. E. MEINZER and R. F. HARE (*U. S. Geol. Survey, Water-Supply Paper 343* (1915), pp. 317, pls. 19, figs. 51).—This report, prepared in cooperation with the New Mexico Experiment Station, deals with the physiography, geology, and water resources of an area of approximately 6,000 square miles in New Mexico, and also takes up in some detail such related subjects as quality of water, irrigation, and soil and native vegetation in relation to water supplies.

In the valley fill it is stated that supplies sufficient in quantity for domestic use and for stock can be obtained practically everywhere. In the waters of the valley fill of the northern area there is no sodium carbonate but there are generally large amounts of sodium chlorid and also important amounts of sodium

sulphate and magnesium sulphate, thus emphasizing the necessity for caution in the use of these waters for irrigation to prevent accumulations of alkali.

In the Cretaceous area many wells have been sunk, both deep and shallow, from nearly all of which sufficient water for domestic use and stock supply is obtained. "The water from most of the springs and wells of moderate depth is hard but of good quality for irrigation and fairly satisfactory for drinking and household use, but the water from the wells in certain localities, notably the immediate vicinity of Carrizozo, is too highly mineralized for drinking or household use and of doubtful character for irrigation."

In the Carboniferous rocks and underlying sediments of the northern plateau section of the basin, the agricultural problem is to obtain water for domestic use and live stock. "Some of the waters, especially those from shallow sources, are fairly satisfactory for domestic use and for drinking, but many are either undesirable or wholly unfit for these uses. . . .

"The soils that are more or less suitable for agriculture can be grouped as the red adobe soils, the gypseous soils, the more ordinary loam soils, . . . and the sandy soils. The soils that produce more or less desert vegetation but are practically worthless for agriculture can be grouped as the gravelly and bowldery deposits, the quartz sands of the dune areas, the gypsum sands, the alkali clays, and the waste in the crevices of the lava beds."

Analyses of samples of the soils of the area made at the station showed them to be generally deficient in nitrogen. It is stated that the phosphoric acid content compares fairly well with that usually found in soils of average fertility. The potash content was variable but was on the whole small as compared with the content of soda and other soluble salts. It is stated that the soils are in poor tilth and need deep cultivation and green manuring.

Analyses further showed large amounts of sulphates and calcium and only very small amounts of carbonates or bicarbonates. In a few cases an excess of chlorin over sodium was found, indicating the presence of either magnesium chlorid or calcium chlorid. It was also found that the average amounts of alkali within the capillary limits increased gradually with decreasing depth of ground water. "Wherever the water table is within about 12 ft. of the surface the soil is liable to contain harmful amounts of alkali, and the nearer the surface the ground water stands the greater is the danger from alkali. In all of the samples taken in localities where the depth to water is less than 10 ft. the alkali content was greater in the first foot of soil than farther down. . . . Sodium chlorid and other alkalis are distributed in appreciable quantities over much of that part of the interior gypseous plain where the water table is at present too low to have any influence on surface conditions."

The distribution of zones of vegetation was found to be influenced by the amounts of rainfall and flood waters and by the depths to ground water. It is stated that only about one acre in 1,000 is under irrigation in the basin. Surface waters have been used to considerable extent with more or less success and the areas prospectively available for irrigation with well waters are outlined as follows: The shallow-water tracts in the Cretaceous area north of Three Rivers, including land adjacent to Nogal Arroyo and near Carrizozo and Oscuro and the surrounding country; the shallow-water tracts in the valleys of the Sierra Blanca and Sacramento Mountains and adjacent foothills, especially in the valley of Three Rivers; a belt on the east side of the basin extending from the lower part of the younger lava bed to some distance south and southwest of Dog Canyon, limited on the north, east, and south by the depth to water and on the west by the alkali and gypsum in the soil; and a narrow belt on the west side of the basin extending from the vicinity of Mound Springs to the meadow

south of the white sands, limited on the north, west, and south by the depth to water and on the east by the alkali and gypsum in the soil.

It is stated that most of the pumping plants thus far installed in the basin are operated by windmills, gasoline engines, or electric motors, but that horse-powers and steam engines are also in use.

"Because of the limitations in regard to both quantity and quality of the underground supply and because of the cost of pumping, it is doubtful whether heavy irrigation, such as is commonly practiced in the Rio Grande Valley and other irrigation districts, will be feasible, except very locally, in Tularosa Basin; but the sparing use of well water to supplement rainfall and flood waters contains more promise and should be given a thorough trial." It is stated that a small amount of well water properly applied as supplemental irrigation with careful methods of farming will add greatly to the yield of certain crops, particularly forage and other field crops, vegetables, and fruit.

The use of surface water free from bacteria as drinking water, HAUPT (*Pharm. Zentralhalle*, 55 (1914), No. 40, pp. 861-866).—The author describes briefly experiments which, in his opinion, demonstrate the feasibility of using definite quantities of calcium hypochlorite in the sterilization of surface water for drinking purposes in emergency cases and at the same time using alum for the precipitation of suspended matter and colloidal matter in solution. The taste may be more or less removed by filtration through iron filings.

The chemical disinfection of water, E. B. PHELPS (*Pub. Health Rpts. [U. S.]*, Reprint 225 (1914), pp. 8, figs. 3).—This paper describes methods and simple apparatus for applying the hypochlorite process in the purification of small community and private water supplies.

Bleaching powder or calcium hypochlorite, it is stated, should be bought on specification to contain not less than 33 per cent available chlorin. The American product is considered less likely to give troublesome odors to the water than the imported product. The minimum quantity of solution which can be properly controlled and measured is said to be about 15 gal. per hour. For small plants hand mixing is said to be satisfactory. The solution in the mixing tank is allowed to stand four hours or longer and may then be drawn off into the solution tanks, where it is diluted to the proper strength. A set of 6 or 7 vinegar barrels properly connected with galvanized iron piping and well painted on the outside with asphaltum or some good mineral paint makes a satisfactory temporary plant. Small plants are said to be most easily run on the constant strength basis.

"On the basis of 33 per cent bleaching powder (which allows for losses in extraction) 25 lbs. per million gallons of water will give one part per million of available chlorin. Clear, colorless ground water, free from iron, or the clear water of large lakes requires, as a rule, from 0.1 to 0.3 parts of chlorin or 2.5 to 7.5 lbs. of bleaching powder per million gallons. Mountain streams and upland water free from color and turbidity and without storage in ponds require from 0.2 to 0.5 parts. Colored river waters, swamp waters, and highly polluted surface waters may require as much as one part or more."

Profile surveys in Willamette River Basin, Oregon (*U. S. Geol. Survey, Water-Supply Paper 349* (1914), pp. 8, pls. 16).—This report, prepared under the direction of R. B. Marshall, describes the general features of the Willamette River Basin and gives plans and profiles of streams therein.

Profile surveys in Wenatchee River Basin, Washington (*U. S. Geol. Survey, Water-Supply Paper 368* (1914), pp. 7, pls. 8).—This report, prepared under the direction of R. B. Marshall, describes the general features of the Wenatchee River Basin and gives a plan and profile of Wenatchee Lake, Wenatchee River, and certain tributaries.

Land drainage in Maryland, J. R. HASWELL (*Maryland Sta. Bul. 186 (1914)*, pp. 69-113, figs. 9).—This bulletin is based upon the work of the Drainage Investigations of this Office in the State of Maryland. Its purpose "is to show briefly what properly constructed drainage improvements have accomplished and will accomplish in developing farm lands in the State, and to offer suggestions that may assist in the proper application of drainage in all parts of Maryland."

There are 517 square miles of swamp and marsh land in the State, the greater part of which occurs in the 2,650 square miles of coastal plain. Under "benefits of drainage" the results obtained in different localities in the State are briefly reported. The author also takes up briefly land drainage for mosquito control.

In an appendix is given the text of the Maryland drainage law.

Concrete in drainage and irrigation, P. T. LIBBERTON (*Trans. Amer. Soc. Agr. Engin.*, 7 (1913), pp. 135-145, figs. 6).—The author discusses the use of concrete in irrigation and drainage structures and points out that its successful use in these depends largely on the proper selection, proportioning, and mixing of materials.

Progress report on cause of disintegration of cements by alkalis, K. STEIK (*Wyoming Sta. Rpt. 1914*, pp. 148-158, figs. 11).—In the course of this work the following compounds have been isolated: (1) Calcium sulphate, (2) calcium hydroxid, (3) calcium carbonate, and (4) one silicate of which the composition has not yet been determined.

"The calcium sulphate hydrated salt was found to be a reaction product between cement and the sulphates of magnesium and sodium. This salt was found deposited in crystalline form from solutions of varying strength, from 1 per cent to 10 per cent. The crystals were in all cases found on the surface of the blocks of cement, deposited either as single crystals or as groups of crystals radiating from a center. . . . In some cases the sulphate of calcium was deposited in amorphous form. This was more noticeable in cements low in lime content. The microscopic examination of the cements which had a great abundance of crystals on the surface did not show their presence inside the cement blocks. The same was found to be true in case of the other compounds mentioned. . . .

"The calcium hydroxid was obtained from cement immersed in solutions of chlorids of magnesium and sodium, also from solutions containing both these chlorids. Also this compound was deposited on the surface in crystals about $\frac{1}{8}$ in. wide and about 1.64 in. thick. . . .

"The calcium carbonate was obtained in amorphous form only from cements in solutions of sodium carbonate."

Further studies were made of the effect of alkali salt solutions on the strength of cements. It was found that high silicia cement when immersed in a 5 per cent solution of equal parts of sodium carbonate, sodium chlorid, and sodium sulphate was reduced in tensile strength 3.5 per cent after 12 months and 14.2 per cent after 26 months and was increased in compressive strength 10 per cent after 12 months and 16.3 per cent after 26 months.

The tensile strength of neat Portland cement when immersed in a 5 per cent solution of sodium chlorid, sodium sulphate, magnesium chlorid, and magnesium sulphate was increased 101.3 per cent after 12 months and decreased 13.3 per cent after 26 months and the compressive strength was increased 46 per cent after 12 months and decreased 25.7 per cent after 26 months. In a similar set of tests increases in strength were observed in all cases.

The tensile strength of a mixture of 1 part cement and 3 parts sand immersed in sodium carbonate, sodium sulphate, and sodium chlorid was decreased 0.7 per cent after 12 months and 2.7 per cent after 26 months and the compressive strength was increased 60.1 per cent after 12 months and decreased 17.2 per cent after 26 months. A similar mixture immersed in a solution of sodium chlorid, sodium sulphate, magnesium chlorid, and magnesium sulphate was considerably reduced in strength after 12 months and could be crushed between the fingers after 26 months.

A mixture of 1 part cement to 1 part sand immersed in a solution of sodium carbonate, sodium chlorid, and sodium sulphate increased in strength in all cases except in tensile strength after 26 months. The same mixture immersed in a solution of sodium chlorid, sodium sulphate, magnesium chlorid, and magnesium sulphate experienced a decrease in strength in all cases except in tensile strength after 12 months.

Permeability tests on gravel concrete (*Engin. Rec.*, 70 (1914), No. 13, pp. 355, 356; *abs. in Indus. Engin. and Engin. Digest*, 14 (1914), No. 10, p. 411).—In tests made at the University of Wisconsin to determine the permeability of concrete to water it was found that the proportions of mixture, time of mixing, sequence of placing materials in the mixer, and method of curing are vital factors when an impervious concrete is required. It was also found that permeability of lean concrete in a direction normal to the pouring is greater than in the direction of pouring.

Wooden gang mold for concrete posts, F. W. IVES (*Farm. Engin.*, 2 (1914), No. 5, p. 85, figs. 5).—The construction and use of this mold is described and illustrated.

Recent road improvements in Hawaii, M. J. ADAMS (*Engin. Rec.*, 70 (1914), No. 13, pp. 342-344, figs. 5).—This article describes road construction in territory where rainfall is excessive and where the soil is from 6 to 8 ft. in depth, overlying lava rock. After one and one-half years of service the puddled macadam surface was covered with a bituminous carpet, using two grades of asphalt and two grades of asphaltic oil. The design of culverts and bridges and the necessary road construction equipment are also described.

Harper's gasoline engine book, A. H. VERRILL (*New York: Harper & Bros.*, 1914, pp. XX+292, figs. 226; *rev. in Engin. News*, 72 (1914), No. 21, pp. 1045, 1046).—This book is intended for mechanics, farmers, and automobilists. It is written in popular form and takes up in turn the construction of the engine, its use at home and elsewhere, and its operation and maintenance.

Tests of substitutes for gasoline, J. A. MOYER (*Power*, 40 (1914), No. 16, pp. 569-572, figs. 4).—Comparative tests of kerosene, alcohol, motor spirit, and mixtures of kerosene and gasoline as substitutes for gasoline in a farm gas engine are reported, the primary object being to determine the maximum power and fuel consumption for each of the fuels used with and without water injection.

The tests showed that the maximum horsepower of the engine is considerably increased, especially with kerosene as fuel, but that the fuel consumption per horsepower-hour is considerably greater with water injection. For purposes of comparison similar tests were made with gasoline without water injection, which showed that the fuel cost per brake horsepower-hour was greater in all cases than with the other fuels. Tests with the so-called air injection devices showed that the economy of the engine is considerably improved when air is injected into the manifold.

The cause of the so-called preignition in kerosene engines, which is distinguished by sharp pounding at the connecting rod, is said to be probably not

preignition at all, but is thought to be due to a "cracking" of the heavier portion of the kerosene.

Motor plowing competition of the North Kent Agricultural Association (*Impl. and Mach. Rev.*, 39 (1913), No. 464, pp. 1089-1092; *abs. in Internat. Inst. Agr. [Rome]*, *Mo. Bul. Agr. Intel. and Plant Diseases*, 5 (1914), No. 6, pp. 800, 801).—Results of a motor plowing competition in which four machines competed are reported. Three, four, and six furrow plows were used.

The portions of land assigned to each machine were substantially of identical character. The depth of the plowing was in all cases approximately 7 in. and the quality of the work was fair. Considering all the usual factors a 20-horse-power motor and a 3-furrow plow made the highest scores.

Standardization of farm wagons, E. E. PARSONAGE (*Trans. Amer. Soc. Agr. Engin.*, 7 (1913), pp. 120-130).—The author points out the inefficiency of the present system of manufacturing and selling of farm wagons to farmers from the standpoint of their construction, and makes recommendations as to methods for bringing about standardization of wagon equipment. These are based on the standardizing and simplifying of the sizes of wagons and wheel heights and the standardizing of the track of wagons and the tire widths and thicknesses.

A cheap and effective homemade plank drag, F. G. KRAUSS (*Hawaii Sta. Press Bul.* 49 (1915), pp. 4, figs. 2).—This bulletin illustrates, describes the construction of, and gives a bill of materials for, a plank drag to be used on Hawaiian soils.

It is stated that the plank drag is most valuable when the soil breaks up "cloddy" and harrowing fails to pulverize it. "Unless the land is too moist, the plank drag should follow the harrow immediately. . . . In going over the ground with the drag a half lap should always be taken, and if necessary, the ground should be cross dragged. The drier and harder the clods the greater should be the weight applied. . . . Care should be taken not to add too much weight when the soil is moist since in so doing the soil may become compacted to an extent far greater than any beneficial results that might otherwise have accrued."

Imports and exports of agricultural machines and implements into and out of Germany in 1913 (*Maschinen Ztg.*, 12 (1914), No. 4, p. 45; *abs. in Internat. Inst. Agr. [Rome]*, *Mo. Bul. Agr. Intel. and Plant Diseases*, 5 (1914), No. 6, p. 806).—Tabular data are given showing the exports to have been greatly in the majority excepting in the case of mowers and reapers, of which about eight times as many were imported as exported.

The manufacture of agricultural machines and implements in Russia in 1911 (*Landw. Masch. u. Geräte*, 14 (1914), No. 13, pp. 15-22, 40; *abs. in Internat. Inst. Agr. [Rome]*, *Mo. Bul. Agr. Intel. and Plant Diseases*, 5 (1914), No. 6, pp. 803-805).—It is stated that this industry in Russia has developed of late years to such an extent that in 1911 it was in a position to place on the home market \$6,502,400 (\$31,643,929.60) worth of machinery and implements. About 820 factories built agricultural machinery, of which 665 were situated in European Russia, 110 in Poland, 37 in the Caucasus, and 8 in Siberia. The total output amounted in 1911 to £5,320,017, which was distributed among the various groups of machinery as follows: Tillage implements £954,530, sowing machines £804,500, harvesting machines £1,312,321, threshing machines £713,360, cleaning and grading machines £239,796, machines for preparing fodder £146,225, gins and transmissions £298,053, power motors £324,062, and other machines and implements and duplicate parts £527,170.

The consumption of agricultural machinery is said to have risen during the last 30 to 35 years from £835,840 to £12,581,870.

Methods and benefits of grading and cleaning grain, H. E. HORTON (*Trans. Amer. Soc. Agr. Engin.*, 7 (1913), pp. 41-60, figs. 4).—Attention is called to the loss to farmers due to weeds, and methods of grading and cleaning grain are described with tests.

It is shown that the cleaning machine removes the chaff, dirt, and light part of the seed, the blast machine sorts the grain according to weight, and both machines remove some of the weed seed. To remove all the weed seed the so-called trieur, which consists simply of a metal cylinder lined with cells of various depths and diameters, is necessary. The trieur separates pieces of broken grain and weed seed corresponding to the insert in use in the machine, separates grain berries according to size, and separates one grain from another.

Other machines for grading and cleaning grain described are the grain centrifugal, the snail separator, the oscillating table, the revolving cylindrical sieve, and the endless belt.

It is pointed out in conclusion that in order to secure the best seed grain the grain should be subjected to a painstaking examination with sieve, scale, and microscope.

The explosibility of grain dusts, D. J. PRICE and H. H. BROWN (*Sci. Amer. Sup.*, 78 (1914), No. 2031, p. 368).—The results of a cooperative study of the explosibility of grain dusts and of methods pertaining to the prevention of such explosions are reported. The following causes have been assigned to many of the explosions in milling plants in this country and abroad: (1) Use of open lights or naked flames, such as lamps, torches, gas jets, lanterns, candles, matches, etc., (2) property fires, (3) introduction of foreign material in grinding machines, (4) electric sparks from motors, fuses, switches, and lighting systems, and (5) static electricity produced by friction of pulleys and belts, grinding machines, etc. The investigation has indicated that a large number of the recent explosions and fires have been caused by the introduction of foreign material into grinding machines.

Disposal of tannery waste, A. ROTH (*Jour. Amer. Leather Chem. Assoc.*, 9 (1914), No. 12, pp. 512-522).—The results of tests of different methods and equipment for the disposal of tannery wastes are reported.

A continuous-flow tank for sedimentation is said to give the best results. It should be baffled at the inlet and outlet and should have ample sedimentation and sludge capacity and good sludge-removing facilities. Sedimentation by the aid of a chemical coagulant was found to be uneconomical in such systems. The sludge was best disposed of by drying on sand beds and using as a fertilizer. The low average rate for the irrigation of tannery sewage is said to limit the use of sewage farming as a means of final disposal to very small tanneries or to tanneries where a large acreage of land is available. Intermittent sand filtration was found to be the best method of final disposal.

The design of permanent farm buildings, E. S. FOWLER (*Trans. Amer. Soc. Agr. Engin.*, 7 (1913), pp. 106-117, figs. 4).—The author draws attention to the economic importance of permanent farm buildings and describes and illustrates the design of an all-concrete barn, which includes horse and cow stalls and a haymow.

Brief instructions for building a pit silo, C. LARSEN (*South Dakota Sta. Bul.* 154 (1914), pp. 83-96, figs. 4).—This is a popular bulletin describing the construction and use of the pit silo and methods for hoisting the silage out of the pit. In four experimental pit silos no trouble was encountered from poisonous gases. Analyses of the silage from these and the college farm are reported.

RURAL ECONOMICS.

Farm costs on the Colorado Agricultural College farm, A. KEYSER (*Colorado Sta. Bul. 203 (1914), pp. 3-56, fig. 1*).—This report outlines the system of cost accounting established for the college farm, and reports data as to the cost of farm machinery and of man and horse labor for a series of years in growing and harvesting various crops, and of the drayage, livery, carpenter work, and miscellaneous services rendered to the different departments by the college farm force as a service bureau.

Land tenure, O. R. JOHNSON and W. E. FOARD (*Missouri Sta. Bul. 121 (1914), pp. 59-110, figs. 10*).—This report presents the results of a farm management survey in four townships of Johnson County, Mo., from the standpoint of land tenure.

Some of the striking points noticed were that in this locality the tenant grew more grain crops and sells a larger proportion of those grown than did the owner. He kept one animal unit for every $5\frac{1}{2}$ acres of ground, while the owner had one animal unit for every $3\frac{1}{2}$ acres. The tenant farmed more land with a given labor equipment. He got lower yields from grain crops and about the same from hay crops. His labor income was \$501, as against \$446 for the part owner and \$314 for the owner, and his family living expenses were \$354, as compared with \$413 for the owner. With the same capital the tenant made the largest labor income, the part owner ranked next, and the owner made the smallest labor income. The tenant usually put in more hours labor than did the owner and obtained a larger labor income for the same amount of work units.

The data show that 43.5 per cent of the tenants remained on the same farm two years or less. Nearly 80 per cent of the tenants moved in less than five years. Tenants living on the same farm from six to ten years made the largest labor income.

Farm owners with more than a rural school education made nearly \$600 more than those who stop with the rural school. The man with a higher education apparently remained a tenant only from one-half to one-fourth as long before becoming an owner as did those who stopped with the rural school.

[Insanity among farm people] (*Bur. of the Census [U. S.], Insane and Feeble-Minded Insts. 1910, pp. 1-179, figs. 10*).—This report contains statistical data showing by States and geographic divisions the number of insane in hospitals and the number admitted in 1910. The following table shows admissions in 1910 by sex and geographic divisions:

Number of insane admitted to hospitals in 1910 per 100,000 population.

Geographic divisions.	Urban community.		Rural community.	
	Male.	Female.	Male.	Female.
New England.....	111.1	101.8	92.7	91.1
Middle Atlantic.....	90.5	82.3	49.9	40.8
East North Central.....	96.1	72.7	56.9	49.6
West North Central.....	83.1	66.1	55.0	43.6
South Atlantic.....	110.4	82.4	35.2	31.5
East South Central.....	82.8	52.5	35.2	31.0
West South Central.....	56.9	55.1	28.1	23.1
Mountain.....	124.2	67.3	44.0	16.9
Pacific.....	95.2	62.8	53.4	32.4
Total.....	94.3	77.5	45.2	37.3

The report also shows that the rate per 100,000 population from urban communities was 73.7 for native whites, against 122.2 for foreign born and 78 for negroes. The corresponding rate for rural communities was 40 for native whites, 78.4 for foreign born, and 26.9 for negroes. The higher rate for foreign born is partially due to the large proportion of the total foreign born population being in the mature age groups.

The report indicates that 21 per cent of the insane admitted in 1910 from urban communities had general paralysis or alcoholic psychosis, whereas a similar percentage for those from rural communities was 10.4.

This report also contains a summary of the laws relating to insanity.

Institutions for insurance against sickness and accidents in rural districts (*Pubs. Sec. Suisse Paysans*, No. 47 (1914), pp. VII+141).—This report describes the Swiss institutions for insurance against sickness and accidents, and the principal kinds of sickness and accidents connected with agriculture as compared with other professions. A model constitution for insurance organizations is included, together with a number of statistical tables showing the frequency of accidents or sickness for various causes by ages and sex.

Farmers must be cooperators, C. O. DRAYTON (*Greenville, Ill.: The Equity Union Publishing Co.*, 1914, 3. ed., pp. 188, figs. 16).—This book consists of a large number of articles relating to the principles underlying farmers' equity unions and contains a copy of the national constitution and by-laws for a local equity exchange.

Cooperative organization business methods, W. H. KERR and G. A. NAHSTOLL (*U. S. Dept. Agr. Bul.* 178 (1915), pp. 24).—Suggestions are offered as to the business methods of cooperative organizations.

According to the authors, among the essential requirements for a system of accounting records for a cooperative marketing organization are a complete set of financial records showing the business transactions and the results obtained and a record of each member's transactions with the organization. They should be capable of taking care of a maximum amount of business during the shipping season and of returning to the members the proceeds from their products within a reasonable time; should show clear pooling records when kept, so that any discrimination can be indicated quickly. There should also be auxiliary records which will give statistics and useful information for the conduct of the business. Since no two cooperative organizations are exactly alike, it is necessary that a system be devised to fit the business for which it is intended.

Every cooperative organization should have an accountant who is thoroughly familiar with the business. Every organization should keep minutes in proper form of all stockholders' or members' and directors' meetings.

The extent of depreciation should be estimated as closely as possible and provided for, and cooperative organizations should make arrangements to set aside specific amounts, or a percentage of profits, for the increase of working capital. The organization should have both an internal and external audit. Auditing circles can be effectively formed where several cooperative organizations are in the same territory.

A bibliography is appended.

[Among the egg and poultry societies of England] (*Co-operation Agr. [London]*, 9 (1915), No. 2, pp. 25-30, figs. 6).—These pages contain a brief description of the methods of carrying on the sale and distribution of eggs and poultry by a number of local organizations.

Report of the Agricultural Organization Society, 1914 (*Rpt. Agr. Organ. Soc. [London]*, 1914, pp. IX+129).—This report outlines the aims of this society,

discusses the principal lines of work carried on and the results obtained, and gives a brief history of the branch organizations.

[Marketing of agricultural products in Queensland] (*Ann. Rpt. Dept. Agr. and Stock [Queensland], 1913-14, pp. 13-19, 25-30, pls. 5*).—This section calls attention to the various problems connected with the marketing of meat, fruit, and dairy products, and with the development of agricultural production in Queensland.

First annual report of the bureau of farm development, 1914 (*Washington Sta. Bul. 120 (1915), pp. 36, figs. 6*).—This report sets forth, by counties, the results of the work for the calendar year 1914. The principal lines of extension work taken up were the control of blow soils and weeds, introduction of forage crops, successful methods of summer fallow tillage, the building up of the hog and dairy industries, the control of orchard pests, and the reclamation of tide flat lands. There were also a number of farm management demonstrations and boys' and girls' clubs formed. The text of the act establishing the bureau (*E. S. R., 28, p. 900*) is appended.

First annual report, department of dry land demonstration and experiment, 1914 (*Washington Sta. Bul. 119 (1915), pp. 16*).—This report sets forth the efforts to improve the agricultural practices in the "dry belt" of Washington. It contains a brief survey of the climatic conditions and agricultural practices and outlines the methods to be used in improving the agricultural conditions in this area. A number of field tests are to be made to determine the best methods of plowing and cultivation and the best crops to be grown. An attempt will be made to distribute trees for windbreaks, to introduce pure live stock, to improve the social and living conditions, to introduce silos, to examine soils, and to collect data regarding rainfall. (See also a previous note, *E. S. R., 30, p. 497*.)

Report of Missouri Country Life Conference, 1914 (*Missouri Bd. Agr. Mo. Bul., 12 (1914), No. 4, pp. 138, figs. 34*).—This report contains a series of addresses concerning the farmer and his family, the country schools, the country church, and other phases of the rural life movement.

The economic organization of England, W. J. ASHLEY (*London: Longmans, Green, and Co., 1914, pp. VIII+213*).—This book contains a series of eight lectures, among which are the English agrarian system, with the manor as starting point; the beginnings of modern farming; the break-up of the manor; and agricultural estates and English self-government.

AGRICULTURAL EDUCATION.

Important features in rural school improvement, W. T. HODGES (*U. S. Bur. Ed. Bul. 599 (1914), pp. 55*).—This bulletin contains extracts and summaries of reports of rural superintendents of schools as to plans for improving the schools under their supervision by means of better administration, courses of study, methods of teaching, buildings and grounds, and closer cooperation of home and school. A study of the reports from which these abstracts are taken reveals that "there is a feeling that the country child will be best educated for whatever life he may lead, whether in the city or in the country, if taught in terms of country life," and that practical subjects, such as agriculture, cooking, sewing, etc., add vitality and interest to the courses of study.

Vocational education and the State, E. DAVENPORT (*School and Home Ed., 34 (1914), No. 4, pp. 131-133*).—In this discussion of the separate system of vocational schools, the author outlines as some of the disadvantages the resulting stratification of society, the need of new and special teachers, and the in-

creased financial outlay. He believes that the proper goal in secondary education is the cosmopolitan high school supported by a community and subsidized both by the State and the Federal Government.

Menominee County Agricultural School and what it does, J. F. WOJTA (*Mich. Farmers' Insts., Inst. Bul.* 20 (1914), pp. 321-328, figs. 3).—The author outlines the provisions of the Act of 1907 and amendments thereto under which county schools of agriculture may be established in Michigan, and gives an account of the work of the Menominee County Agricultural School.

[**Agricultural education in Canada**] (*Agr. Gaz. Canada*, 1 (1914), No. 7, pp. 519-522, 524-529, 551-558, 563, 569, 570, 593, figs. 4).—These pages include statements of the benefactions for agriculture in Canada and of the Federal appropriations; a detailed account of the buildings and equipment, instruction, etc., of Macdonald College, by F. C. Harrison; notes on school gardens in Nova Scotia and Quebec; and an article entitled Consolidation Favorable to Agricultural Education, by S. B. McCready.

Annual report of the education branch of the distribution of grants for agricultural education and research in the year 1913-14 (*Bd. Agr. and Fisheries [London], Ann. Rpt. Ed. Branch, 1913-14*, pp. VIII+149, pl. 1).—The form of this report has been recast in this issue, and in addition to a summary of the progress of the year chapters are devoted to descriptive notes on agricultural education and extension work in each of the 11 educational provinces of England and Wales, notes on agricultural research institutions, investigations aided by special research grants and miscellaneous grants, grants from the Development Fund paid through the board, and publications. Eight appendixes contain tabulated information concerning grants awarded for agricultural education and research in 1913-14, research scholarships in agricultural science, organization lists, other statistics, etc.

Agricultural education and research (*Rpt. Bd. Agr. Scot.*, 2 (1913), pp. XXII-XXXII).—This is a report of progress for the year 1913 in the agricultural education and research work under the control of the board of agriculture of Scotland.

Present state of agricultural education in Germany, K. VON RÜMKE (*Internat. Inst. Agr. [Rome], Mo. Bul. Agr. Intel. and Plant Diseases*, 5 (1914), No. 5, pp. 578-597).—The author gives an account of the present status of agricultural education in Prussia, including statistical data on attendance, results of examinations, and expenses of the institutions of various grades and of other types of agricultural instruction, together with a discussion of this data, and a table of similar information for the various other States of Germany.

The anniversary of the Agricultural Institute of the University of Halle, O. ENNKER (*Deut. Landw. Tierzucht*, 18 (1914), No. 24, pp. 282-284, figs. 3).—Notes on the development of the Agricultural Institute of the University of Halle, established 50 years ago, and a description of its equipment are given.

The inauguration of the Royal National Higher Forestry Institute (*Alpe [Italy]*, 2. ser., 1 (1914), No. 1-2, pp. 3-27, pl. 1).—This account of the inauguration of this institute, at Florence, Italy, contains in addition to several addresses an outline of its functions and a description of the 2-year course. The institute takes the place of the Royal Forestry Institute at Vallombrosa, which has been discontinued.

Danish elementary rural schools with some reference to seminaries for the training of rural teachers, H. W. FOGHT (*U. S. Bur. Ed. Bul.* 598 (1914), pp. 45, pls. 5, figs. 4).—This bulletin gives a detailed description of the elementary rural schools of Denmark, including their organization, management, course of study, architecture, school gardens, playgrounds, and maintenance; the office

and tenure, training, salaries, and old-age pensions of rural teachers; and a brief summary of the author's impressions, with some applications to American life.

Agriculture in elementary schools, J. P. McLENNAN (*Ed. Gaz. and Teachers' Aid, 1914, June 29, Sup., pp. 19, figs. 6*).—The author outlines work in agriculture for elementary schools in Victoria, Australia, including theoretical instruction and laboratory and plot experiments in soils, plants, crops, and forestry. Appendixes relate to work suitable for dairying, fruit growing, wheat growing, and irrigation districts, raising trees from seed at state schools, and the vegetable garden.

[Reading courses in agriculture and home economics] (*Cornell Reading Courses, 2 (1913), Nos. 40, pp. 145-156, figs. 6; 42, pp. 157-184, figs. 6; 44, pp. 185-200, figs. 10; 46, pp. 201-219, figs. 7; 48, pp. 221-240, figs. 11; 3 (1913), Nos. 50, pp. 1-28, figs. 18; 52, pp. 29-44, figs. 8; 53, pp. 73-84, figs. 2; 3 (1914), Nos. 57, pp. 105-146, fig. 1; 59, pp. 149-187, figs. 27; 60, pp. 117-131, pls. 4, fig. 1; 61, pp. 189-204, pl. 1, figs. 21; 62, pp. 133-164, figs. 4; 63, pp. 205-212, figs. 3; 64, pp. 165-212, figs. 33; 65, pp. 213-254, figs. 30; 66, pp. 213-228, figs. 8; 67, pp. 257-264, figs. 3; 68, pp. 229-248, figs. 13; 69, pp. 265-284, figs. 6; 70, pp. 249-271, figs. 11; 71, pp. 285-295, figs. 9; 72, pp. 273-291, figs. 14*).—These bulletins offer instruction in the following subjects: County, town, and village forests; tith and tillage of the soil; methods of breeding oats; feeding and care of the horse; culture of the cherry; nature, effects, and maintenance of humus in the soil; culture of the blackberry; the Christmas festival; a syllabus of lessons for extension schools in home economics; sewage disposal for country homes; farm butter making; attic dust and treasures; methods of determining the value of timber in the farm woodlot; the young woman on the farm; the rural school and the community; farmhouse amusements for girls and boys; meadows in New York; canning clubs in New York State—organization, principles, and methods of canning, and canning equipment; improving the potato crop by selection; soil moisture and crop production; and culture of the grape.

Finding time for agriculture, G. M. WILSON (*Iowa Agr., 15 (1914), No. 4, pp. 242-244*).—In this article the author illustrates, taking arithmetic and spelling as examples, how time may be saved for instruction in agriculture, home economics, and manual training, by omitting useless or obsolete material in other subjects.

Methods of instruction in soils in the high-school curriculum, H. BODE (*Kühn Arch., 5 (1914), pp. 423-450*).—The author discusses methods of instruction in soils as a fundamental principle in (1) soil cultivation and plant food and (2) land valuation in the higher agricultural education institutions of Germany, and suggests an outline of subject matter for the winter and summer semesters.

MISCELLANEOUS.

Annual Reports of the Department of Agriculture, 1914 (*U. S. Dept. Agr. Rpts. 1914, pp. V+359*).—This contains the reports of the Secretary and heads of bureaus and other administrative officers. The various reports are also issued as separates.

Twenty-seventh Annual Report of Alabama College Station, 1914 (*Alabama Col. Sta. Rpt. 1914, pp. 38*).—This contains the organization list, a financial statement for the fiscal year ended June 30, 1914, and reports of the director and heads of departments on the work and publications of the station during the year. The report of the veterinarian is abstracted on page 783 of this issue.

Annual report of the director for the fiscal year ending June 30, 1914 (*Delaware Sta. Bul.* 107 (1915), pp. 15).—This contains the organization list and the report of the director on the work and publications of the station. It includes a financial statement for the fiscal year ended June 30, 1914.

Annual Report of Guam Station, 1914 (*Guam Sta. Rpt.* 1914, pp. 27, pls. 5, figs. 6).—This contains a summary of investigations by the special agent in charge, for the most part abstracted elsewhere in this issue.

Annual report of Hawaii Station, 1914 (*Hawaii Sta. Rpt.* 1914, pp. 73, pls. 3).—This contains the organization list, a summary by the special agent in charge as to the investigations of the year, and reports of the chemist, acting horticulturist, agronomist, entomologist, and superintendents of the substations. The experimental work recorded in these reports is for the most part abstracted elsewhere in this issue, as is also a special article on The Composition of Hawaiian Fruits and Nuts (p. 761).

Biennial Report of Missouri State Fruit Experiment Station, 1913–14 (*Missouri Fruit Sta. Rpt.* 1913–14, pp. 32, pls. 6).—This contains the organization list, a brief report of the director for the biennium ended December 31, 1914, and reports of the entomologist and pathologist abstracted elsewhere in this issue.

Director's report for 1914, W. H. JORDAN (*New York State Sta. Bul.* 393 (1914), pp. 627–657).—This contains the organization list and a review of the work and publications of the station during the year.

Thirty-third Annual Report of Ohio Station, 1914 (*Ohio Sta. Bul.* 278 (1914), pp. XXV, pl. 1).—This contains the organization list, a financial statement for the fiscal year ended June 30, 1914, and a report of the director summarizing the work and publications of the station during the year.

Twenty-fourth Annual Report of Washington Station, 1914 (*Washington Sta. Bul.* 118 (1914), pp. 45, figs. 13).—This contains the organization list, a report of the work and publications of the station during the year, and a financial statement for the fiscal year ended June 30, 1914. The experimental work reported is for the most part abstracted elsewhere in this issue.

Report of West Virginia Station, 1913 and 1914 (*West Virginia Sta. Rpt.* 1913–14, pp. 47, pls. 6, fig. 1).—This contains the organization list; a report of the director on the work, publications, and needs of the station; and a financial statement for the fiscal years ended June 30, 1913, and June 30, 1914.

Twenty-fourth Annual Report of Wyoming Station, 1914 (*Wyoming Sta. Rpt.* 1914, pp. 119–194, figs. 11).—This contains the organization list; a financial statement for the fiscal year ended June 30, 1914; reports of the director and heads of departments, the experimental work recorded being for the most part abstracted elsewhere in this issue; meteorological observations noted on page 717 of this issue; an article entitled The Transmission of Swamp Fever, by J. W. Scott, abstracted on page 754 of this issue; and a reprint of a press bulletin on Plant Enemies.

Appropriations asked for the main station and substations, biennium 1915–16, 1916–17 (*Texas Sta. Circ.* 5, n. ser. (1915), pp. 32, figs. 3).—Estimates for state appropriations are presented and discussed in detail.

Press Bulletins (*Ohio Sta. Bul.* 278 (1914), pp. 407, 408).—Reprints of press bulletins on the ox-warble fly and dipping tick-infested sheep.

Preparation of articles for the Journal of Agricultural Research (*Washington: U. S. Dept. Agr.*, 1914, pp. 8).—This outlines the general procedure followed in the selection of manuscripts for the *Journal*, and the rules for their preparation.

NOTES.

Florida Station.—A state plant act was signed by the governor April 30. It carries an appropriation of \$195,000 for the ensuing biennium, of which \$125,000 is to be used for citrus canker eradication. The state board of control having charge of the institutions for higher education in Florida has been designated as the plant board to carry out the provisions of the act. It is proposed to organize the work under departments of citrus canker eradication, plant pathology, insect pests, and nursery inspection. The board is given authority to cooperate with this Department, the State Department of Agriculture, the station, and other agricultural agencies.

Idaho University and Station.—Plans for a building to house the department of farm engineering has been approved, and the building will be erected during the summer. Extensive improvements to Morrill Hall will also be made to increase the facilities of the departments of farm crops and horticulture. The new work of the station includes animal nutrition investigations and experiments with silage from crops not as yet commonly grown in the Northwest for silage purposes. Both projects are to be carried on cooperatively by the departments of animal husbandry and chemistry.

E. P. Taylor has resigned as field horticulturist to engage in private work in Utah. G. J. Downing, assistant horticulturist, has been detailed to take active charge of the project formerly in his charge on the determination of the water requirements of apple crops and the effect of varying amounts of irrigation water on the keeping properties of apples. T. H. Parks has resigned as field entomologist to engage in private work. H. P. Fishburn, assistant professor of agricultural chemistry, has been granted a year's leave of absence for graduate work at the University of Chicago. Frank Lafrenz of the class of 1915 will become superintendent of the Sandpoint substation in June.

Minnesota University.—Twenty-six courses in agriculture and home economics are announced for the summer session of the college of agriculture.

Missouri University and Station.—The department of farm management will conduct a farm survey in several parts of the State during the coming summer.

R. H. Besse has resigned as assistant to the state leader of farm advisers to become state leader of county agents for Wyoming. T. J. Talbert, extension entomologist at the Kansas College, has been appointed extension assistant professor of entomology, Miss Carrie L. Pencost, extension instructor in home economics, and A. H. Hollinger, now assistant in entomology, deputy inspector of nurseries.

Montana College and Station.—Leo Faust has been appointed to the state board of education vice O. W. McConnell. C. N. Arnett, professor of animal husbandry in the Iowa College, has been appointed head of the animal husbandry department beginning soon after June 1.

New Jersey College and Station.—Irving L. Owen, associate agronomist in the station and manager of the college farm, has resigned to become county farm demonstrator for Middlesex County and has been succeeded by Charles S. Van Nuis. Miss Marion T. Pleasants, laboratory assistant in botany, and

Willis H. Pearson, assistant chemist, have resigned. Miss Fannie F. Cooper has been appointed assistant in extension work in home economics, and W. Raymond Stone orchard foreman.

North Carolina Station.—C. W. Mitchell, of Aulander, has succeeded K. W. Barnes as a member of the governing board of the station.

North Dakota College and Station.—The recent legislature passed an act which provides for a board of regents to have charge of all of the higher institutions of learning in the State, including the normal schools. Recent appointees to the board of trustees of the college and station include Walter Reed of Amenla, F. Kindred of Hillsboro, and August Hanson of Fargo.

Ohio State University and Station.—Arrangements have now been completed with eight other colleges of the State for the five-year combination arts-agricultural course (E. S. R., 30, p. 397), and several other institutions have the plan under consideration.

A bill is pending in the legislature for the establishment of a branch experiment station on the university farm with the dean of the college of agriculture as associate director. The bill provides for experimental work in connection with the courses given by the different departments, duplication of the station work at Wooster being avoided. The expenses of the substation would be defrayed from the university funds.

Dean H. C. Price of the college of agriculture has resigned, effective July 1. George Livingston, assistant professor of agronomy since 1911, has resigned to become specialist in grain marketing in the Office of Markets of this Department.

Oklahoma Station.—Recent appointments include A. G. Weigel, assistant chemist at the Massachusetts Station as assistant chemist, effective March 1, and D. Glen Morgan as assistant chemist in the feed and fertilizer division.

Pennsylvania Institute of Animal Nutrition.—J. W. Park, assistant in animal nutrition since 1912, has resigned to accept a position with the Office of Markets of this Department.

Virginia Station.—Dr. H. S. Reed, plant pathologist and bacteriologist since 1908, has resigned to accept a similar position at the Citrus Station at Riverside, Cal., and has been succeeded by Dr. F. D. Fromme, assistant botanist at the Indiana Station.

Virginia Truck Station.—H. H. Zimmerly, instructor in horticulture in the Pennsylvania College, has been appointed assistant horticulturist beginning June 1. J. A. McClintock has been appointed assistant plant pathologist beginning June 15.

Seventh Graduate School of Agriculture.—The next session of the Graduate School of Agriculture, under the auspices of the Association of the American Agricultural Colleges and Experiment Stations, will be held at the Massachusetts Agricultural College, Amherst, Mass., in July, 1916. The headquarters of the school will be in the large agricultural building which is now being erected on the campus.

Agricultural Education at The Southern Conference for Education and Industry.—The Southern Conference for Education and Industry, organized by the merging of the forces represented by the Southern Educational Association and The Conference for Education in the South, held a 4-day meeting at Chattanooga, Tenn., beginning April 27.

The departments and special conferences of the preceding organizations were organized into a small number of working bodies, such as committees of the Southern Educational Council, and community, agricultural education, grain growers', and live stock, fruit growers', bee culture, marketing, artisans', college, teachers', country church, and teacher training conferences.

At a joint conference of the college representatives, superintendents, and teachers, home work with school credit was discussed. The leader of this joint conference, J. F. Marsh, of West Virginia, submitted a general home-project plan aiming to give outside activities sufficient cultural value to warrant school credit and thus bring about a closer relation between the home and the school. The plan set forth methods for using the home, the garden, the farm, the shop, and the factory as laboratories, thus making the school a factor in community progress.

The Southern Educational Council considered (1) what the school is, and (2) what it shall undertake. Under these general propositions one of the topics considered was what should be the relation of the country teacher to the home and extension work in agriculture and home making. Among the topics considered by the teachers' conference may be mentioned a plan for making the club an integral part of the work of both town and country schools, including (1) a boys' corn club, (2) a girls' gardening club, (3) an arts and crafts club, with related exercises in reading, writing, drawing, etc.

The theme for discussion at the college conference was The Readjustment of Ideals, Courses, and Methods to Develop Leaders. In discussing The Relation of the College Curriculum to Human Life and Work, Dr. A. C. True, of this Office, said among other things:

"In a general way agriculture, mechanic arts, commerce, and the household arts are the general terms under which the industries may be grouped. In the elementary school the child can easily be brought into contact with materials and principles dealt with in the industrial world through simple objective instruction in nature study, elementary agriculture, wood and metal working, cooking, sewing, playing at store-keeping, etc. In the secondary school he can go further in the technique and principles of the more fundamental arts. In the college he should learn something of the great diversity of the industries, the opportunities they offer for the application of scientific principles and for original research, their relations to each other and to the professions and fine arts, and the economic, sociological, ethical, governmental and other factors involved in their proper development, or in general their true place and functions in the body politic.

"In such studies agriculture, the most fundamental of the arts and much more comprehensive in its range of activities and relations than most people think, may well have a prominent place. The narrow way in which most college men, including those brought up on farms, think and speak about agriculture is to me very interesting and deplorable. It seems to mean to them merely the raising of a few crops, e. g., corn, hay or beans, or a few animals, e. g., pigs or cows. They seem never to have considered the wide range of even American agriculture, the many sciences to which it is closely related, the great economic, governmental, and sociological interests involved in the development of our agriculture and our rural communities. Or if they have incidentally thought of some of these things they have little appreciation of their real importance and significance. And this narrowness of outlook of college men pertains also to other industries."

Necrology.—Elisha Wilson Morse, editor of the sections of animal production and dairying of *Experiment Station Record* from 1908–1913, and subsequently engaged in editorial work in the Dairy Division of this Department, died at Washington, D. C., April 18. Professor Morse was born at Brockton, Mass., April 20, 1866, and attended the Massachusetts Agricultural College for a short time. He was graduated from the Bussey Institution of Harvard University in 1897, and remained there until 1908 as instructor in natural history,

teaching a wide range of subjects but especially animal husbandry and dairying.

In his various activities he acquired an unusual acquaintance with the literature of these subjects, particularly as regards animal nutrition and genetics and the history of domestic animals. He gave a course of lectures at the fourth and fifth Graduate Schools of Agriculture, and his preliminary studies as to the ancestry of domesticated cattle, in which he had become a recognized authority, were published in the report of the Bureau of Animal Industry for 1910 (E. S. R., 27, p. 172).

Henry E. Van Deman, well known for his writings and other activities in pomology, died at Washington, D. C., April 28. Professor Van Deman was the first professor of horticulture at the Kansas College and the first head of the division of pomology of this Department. He resigned in 1893 to take up horticultural, editorial, and other work and has been a contributor to many periodicals and has served as a judge of exhibitions of fruit in nearly every State.

The death in the European War on November 3, 1914, is reported of Otto Maurer, associated about 1911 with the bacteriological studies on eggs at the Kansas Station. He was educated in Germany and the University of Wisconsin and was 26 years of age.

Charles H. Martin, who had been working in collaboration with the Rothamsted Experimental Station on soil protozoa, and had published several contributions on the subject and on the cecal parasites of fowls, was killed in the European War May 3.

Miscellaneous.—The Ohio Agricultural Commission was abolished by the recent legislature, being succeeded by a state board of agriculture of 10 members appointed by the governor to serve without compensation and with an executive secretary. All of the powers of the commission will devolve upon the board except the control of the Ohio Station, for which a separate body is provided, and the agricultural extension work, including farmers' institutes, which is placed in the charge of the Ohio State University.

Breeder's Gazette notes that W. G. Scholtz has been appointed director of farm markets in Idaho under a new law effective May 8. His duty will be to cooperate with producers and consumers in plans of distribution, to investigate alleged frauds in the sale of real estate to homeseekers, regulate advertising pertaining to colonization, maintain a farm labor employment bureau and lists of farm property for sale for the use of prospective buyers, and otherwise improve farm life conditions.

EXPERIMENT STATION RECORD.

VOL. XXXII.

ABSTRACT NUMBER.

No. 9.

RECENT WORK IN AGRICULTURAL SCIENCE.

AGRICULTURAL CHEMISTRY—AGROTECHNY.

Yearbook of chemistry, edited by R. MEYER (*Jahrb. Chem.*, 23 (1913), pp. XII+642).—A retrospect of the more important progress made in the realm of pure and applied chemistry during 1913, including among others sections on Physical Chemistry, by H. Freundlich; Inorganic Chemistry, by K. A. Hofmann; Organic Chemistry, by E. Hjelt; Physiological Chemistry, by P. Rona; Pharmaceutical Chemistry, by H. Beckurts; Chemistry of Foods and Condiments, by H. Beckurts; Agricultural Chemistry, by A. Morgen and C. Beger; Technology of Sugars, by A. Herzfeld and K. Zablinsky; The Fermentation Industry and Starch Manufacture, by M. Delbrück and O. Mohr; Fats, Waxes, and Mineral Oils, by D. Holde; and Tanning, by M. Nierenstein.

The hydrogen ion concentration, L. MICHAELIS (*Die Wasserstoffionen-Konzentration*. Berlin: Julius Springer, 1914, pp. XIII+210, figs. 41).—This deals with the significance of the hydrogen ion concentration for biology and sets forth in detail the methods of measuring it. It is divided into three parts, namely, theoretical significance of the hydrogen figure, the hydrogen figure of various fluids in the living organism, and the measuring of the hydrogen figure.

The volume is the first of a series of monographs intended to cover the field of plant and animal physiology. It is issued by M. Gildemeister, E. Godlewski, C. Neuberg, F. Czapek, and J. Parnas, and edited by the two last named.

Contribution to our knowledge of the glycerids of fats and oils.—IV–VIII, A. BÖMER ET AL. (*Ztschr. Untersuch. Nahr. u. Genussmtl.*, 25 (1913), No. 6, pp. 321–386, figs. 2; 26 (1913), No. 10, pp. 569–618, figs. 10; 27 (1914), No. 1–3, pp. 153–172, figs. 2).—By repeated fractional solution in ether, pure glycerids of saturated fatty acids were obtained from lard. Tristearin, present in beef and mutton fat, was absent in lard. The insoluble glycerid of lard is not heptadecyldistearin as believed by Kreis and Hafner (*E. S. R.*, 16, p. 332) but is a palmityldistearin. It differs in its melting point and crystalline structure from the palmityldistearin noted in mutton tallow, and in all probability exists in the two as the α and β forms.

Lard also contains a dipalmitylstearin but whether this is identical or isomeric with a stearyldipalmitin present in mutton tallow could not be established. The melting point of stearyldipalmitin and α -palmityldistearin was not affected by melting the crystals. In the lards examined the amount of stearyldipalmitin was about 2 per cent and of α -palmityldistearin about 3 per cent.

In the preparation of α -distearin from α -dichlorhydrin and potassium stearate a large amount of tristearin was produced at the same time. The melting point of the α -distearin was 77.8° C. (corrected, 78.5°), but a double melting point could not be noted.

In the synthetic preparation of β -palmityldistearin from α -distearin and palmitic acid appreciable amounts of tristearin were formed and apparently also some stearyldipalmitin. Synthetic β -palmityldistearin melted in the neighborhood of 63° , and in this regard and in its crystallization from ether and the form of its crystals it resembled the palmityldistearin from mutton tallow. The compound present in mutton tallow is probably the β combination.

The Polenske number is deemed suitable only for determining the grosser adulteration of lard with beef or mutton tallow. The quality of the reaction is not increased by previously crystallizing the fat from solvents. In many cases as much as 20 per cent of tallow can not be noted with it in lard, and the authors' method, which depends on the difference in the melting point of glycerids and the fatty acids of lard and tallow (beef, mutton, and press) is preferred. This method is described with much detail. Leys' (E. S. R., 19, p. 611) and Emery's (E. S. R., 20, p. 11) methods did not furnish satisfactory results. The authors believe that in order to obtain satisfactory results the saturated fatty acids must be prepared in a more or less pure state, or, to say the least, more definite characteristics of the respective glycerids must be determined.

The authors' method has been studied with mixtures of lard, beef tallow, and plant oils (coconut, peanut, sesame, and cotton-seed oils), hardened oils (E. S. R., 28, p. 616), mixtures of hardened oils and lard, so-called abnormal lards, mixtures of butter and lard, and lard and goose fat. The so-called abnormal lards were from animals fed on corn, coconut cake, cotton-seed meal, and sesame-seed meal. In none of the fats of these animals were there any signs present such as indicated by the new melting point difference method of the difficultly soluble glycerids and their fatty acids which might make it appear as though beef tallow were added.

Linseed mucilage, A. NEVILLE (*Jour. Agr. Sci. [England]*, 5 (1913), No. 2, pp. 113-128).—The vegetable mucilages have been only sparingly studied. These experiments show that linseed mucilage is a substance of carbohydrate nature, having all the characteristics of hydrated cellulose, and that the term "mucocellulose" given to it by Cross and Bevan is well chosen. On hydrolysis it yields both hexose and pentose sugars and practically nothing else. It is considered very doubtful whether the other products obtained in hydrolyzing an average sample are decomposition products, or, at any rate, direct decomposition products of pure mucilage. The experimental results draw attention once more to the use of the term "soluble carbohydrates" in connection with feeding stuffs. In the usual routine analysis of feeds many different compounds are grouped under this heading and are necessarily assigned one feeding value.

The amount of water-soluble carbohydrates in flaxseed, G. R. VAN KAMPEN (*Landw. Vers. Stat.*, 83 (1914), No. 5-6, pp. 471-476).—The sugar content of flaxseed and linseed cake was determined. The amounts found in the seeds varied from 2 to 2.5 per cent and the cake coming therefrom contained about 3 to 4 per cent. The sugar may come from either the glucosids or mucilage present in the seed but only glucose could be detected. Sugar could be detected in the flaxseed coat with copper sulphate and potassium hydroxid. On heating a section of the seed a precipitation of cuprous oxid was very noticeable. The deposition of copper oxid was found to be of less degree in the parenchymatous and sclerenchymatous cells and absent in the innermost parts of the endosperm and the cotyledon. From the fact that the greater part of the sugar is found in the seed coat and is lost through germination, it is concluded that it does

not serve as a reserve material. The results also have a direct practical bearing in determining whether a molasses feed with a linseed base has added sugar or not.

A reaction for protein was given in the cotyledons, and it was very definite in the aleurone grains.

Studies on enzym action.—XII, The esterase and lipase of castor beans, K. G. FALK and K. SUGIURA (*Jour. Amer. Chem. Soc.*, 37 (1915), No. 1, pp. 217-230).—The results regarding extraction, described in the paper previously reported (*E. S. R.*, 31, p. 711), were confirmed with a new castor bean preparation.

"The action of the castor bean preparation on triacetin in the presence of some neutral salts is described. The activity of the preparation was tested after drying and heating under different conditions. An esterase preparation, active toward ethyl butyrate, was separated by extraction with water, and its properties studied in solution and in the solid form. Its probable identity with glycerophosphatase was suggested. A lipase preparation, active toward triacetin, was separated by extraction with 1.5 normal sodium chlorid solution, and its properties studied. The forms of combination of the nitrogen in the preparations are determined. The probable protein nature of the esterase and lipase is discussed."

The thermoregeneration of sucrase, G. BERTRAND and M. ROSENBLATT (*Compt. Rend. Acad. Sci. [Paris]*, 158 (1914), No. 20, pp. 1455-1458; *abs. in Jour. Chem. Soc. [London]*, 106 (1914), No. 621, I, pp. 909, 910).—This is a study of the hydrolyzing properties of invertase, prepared from yeast by different processes, after exposure to varying temperatures.

A maceration of dried yeast heated at 70 or 80° C. for one minute loses all its hydrolyzing power, whereas if heated at 90 or 100° for one minute it regains a large part of its hydrolyzing power. "A sample of fresh baker's yeast, ground with sand and water, does not show this regeneration of hydrolyzing power at the higher temperature. Successive treatment of this yeast with alcohol and ether yields a powder which shows no sign of regeneration, whereas two successive treatments with acetone, followed by rapid filtration and dehydration, give an invertase which exhibits the above phenomenon of thermoregeneration. A sample of the yeast which has undergone autolysis for from one to two days or even four days, when putrefaction has set in, yields, by subsequent maceration with water, a solution of invertase which shows very marked regeneration when heated to 90 or 100° for one minute, whilst being almost inactive after heating to 70 or 80° for the same time."

The relationship between the protein substances of yeast and sucrase, P. THOMAS (*Compt. Rend. Acad. Sci. [Paris]*, 158 (1914), No. 22, pp. 1597-1600; *abs. in Jour. Chem. Soc. [London]*, 106 (1914), No. 621, I, p. 909).—Cerevisin, obtained from yeast after contact with water, was found to hydrolyze sucrose. This hydrolyzing power increased with the fineness of the powder and the temperature used in maceration. Similar phenomena were not noted with the proteins obtained in a coagulated condition from yeast, and invertase therefore is apparently formed from cerevisin through the agency of water. The hydrolyzing powers of cerevisin were greater with autolyzed than with fresh yeast. This is of interest in connection with Bertrand and Rosenblatt's work on the thermoregeneration of invertase, noted above.

On soy bean urease.—The effect of dilution, acids, alkalis, and ethyl alcohol, E. K. MARSHALL, JR. (*Jour. Biol. Chem.*, 17 (1914), No. 3, pp. 351-361).—By this work it is shown that the hydrolysis of urea by urease is practically proportional to the enzym concentration. The velocity increases with dilution to a maximum, and with further dilution decreases slightly. "The

velocity of the hydrolysis is independent of the hydrogen or hydroxyl ion concentration within rather narrow limits. Hydrochloric acid or sodium hydroxide in sufficient amounts inhibits the action of the enzyme and also destroys it. Ethyl alcohol exercises only a moderate inhibitory effect, and its destructive action is apparently very slight."

The mode of action of urease, D. D. VAN SLYKE, G. ZACHARIAS, and G. E. CULLEN (*Abs. in Proc. Soc. Expt. Biol. and Med.*, 11 (1914), No. 5, p. 155).—The alkalinity of the ammonium carbonate generated during the process accounts for the retardation of urease activity.

"When the solution is kept neutral by a proper phosphate mixture the products have no effect on the velocity of the reaction. Elimination of the effect of the products makes urease a particularly favorable enzyme with which to study the reaction between enzyme and substrate. The results indicate that the action consists of two successive reactions; combination of enzyme and substrate in definite proportions; and decomposition of the compound, the urea being thrown off as ammonium carbonate; each of the two reactions consuming a definite portion of the total time. Formulation of these relations leads to

the equation $t = \frac{I}{c} \log \frac{a}{a-x} + \frac{x}{d}$, t representing the time required for the decom-

position of x amount of the initial substrate amount, a ; c is a constant representing the velocity of combination of enzyme and substrate, d representing the velocity of decomposition of the complex. The values of c and d can be determined independently, and one can thereby determine whether changes in conditions affect the combination reaction or that of decomposition. Neutral salts retard the combination. Alkaline reaction hastens it, but retards the decomposition. Slightly acid reaction greatly retards the combination, affecting the other reaction but little. The independent variation of the two phases of the process of enzyme action explains some previously obscure facts in regard to the effect of alkalis, acids, and other substances on enzyme action."

The preparation of "neutral" ammonium citrate, E. D. EASTMAN and J. H. HILDEBRAND (*Jour. Indus. and Engin. Chem.*, 6 (1914), No. 7, pp. 577-580, figs. 3).—Following a discussion of methods previously proposed by others for preparing neutral ammonium citrate (*E. S. R.*, 29, pp. 203, 718), it is announced that with the aid of the hydrogen electrode^a an indicator method has been developed for the preparation of triammonium citrate. The hydrogen ion concentration given by a solution of this salt having a specific gravity of 1.09 is $10^{-7.4}$. "This concentration is obtained in the preparation of the citrate by the use of an easily prepared color standard, made by mixing HCl and Na_2HPO_4 solution. The results of a simultaneous determination of the 'neutral point' with the electrode and conductivity methods are shown graphically, and there are given results of several trials of the formula suggested."

The difficulties of the fertilizer chemist in determining the available phosphoric acid do not seem to be due entirely to the lack of uniformity of ammonium citrate solution used. "It may be impossible to distinguish sharply between 'reverted' and 'available' phosphate by means of neutral ammonium citrate solution."

Cause of error in the precipitation of ammonium-magnesium phosphate in the presence of ammonium citrate, A. QUARTAROLI (*Staz. Sper. Agr. Ital.*, 46 (1913), No. 5, pp. 322-328).—It is believed by some that ammonium-magnesium phosphate is not entirely insoluble in a strong solution of ammonia, and that danger also exists of the precipitation of magnesium oxycitrate. In these investigations it is shown that when either ferric chlorid or aluminic chlorid

^a *Jour. Amer. Chem. Soc.*, 35 (1913), Nos. 7, pp. 847-871, figs. 15; 10, p. 1538.

is present the precipitation of ammonium-magnesium phosphate is somewhat inhibited.

Investigations on the determination of phosphorus in fertilizers and feeding stuffs, C. DUSSERRE and P. CHAVAN (*Mitt. Lebensm. Untersuch. u. Hyg., Schweiz. Gsundtsamt.*, 4 (1913), No. 4, pp. 261-267; *abs. in Chem. Ztg.*, 37 (1913), No. 87, p. 877).—It is stated that the Pemberton method (E. S. R., 6, p. 865), when slightly modified, yields results which are comparable with the method usually used, and is rapid, inexpensive to conduct, and has other great advantages. As a result of determining the phosphorus content of meadow hay from various lots harvested in different years, it is said that of each 100 parts of phosphorus from 4 to 9 parts are present as phosphatids, 55 to 74 parts in inorganic combination and as phytin, and 21 to 40 parts as nucleoproteins. By fertilizing with phosphorus the yield and phosphorus content of the plant are increased, especially that inorganically combined and the phytin fraction. For determining phosphorus in organic substances (hay extracts) Neumann's method is recommended, but it yielded higher results than the ashing method.

The estimation of phosphates in soil extracts, J. A. PRESCOTT (*Jour. Agr. Sci. [England]*, 6 (1914), No. 2, pp. 111-120).—A series of experiments made with the object of determining the best conditions under which the Pemberton procedure may be used. The method finally adopted, inclusive of reagents, is as follows: Reagents—concentrated ammonium nitrate, 500 gm. of ammonium nitrate, in 1 liter of water; ammonium molybdate solution, 150 gm. ammonium molybdate dissolved in 1,000 cc. of water and poured into 1,000 cc. of nitric acid (specific gravity 1.2); 2 per cent sodium nitrate.

"A measured volume of soil extract containing 5 to 10 mg. P_2O_5 is evaporated to dryness on a gently heated sand bath and the residue ignited at a dull red heat for 15 minutes, as in Neubauer's method. The residue is taken up with 50 cc. of 10 per cent sulphuric acid and digested for half an hour on a sand bath. The extract is diluted if necessary, filtered, and the residue washed with hot water; filtrate and washings amounted to 110 cc. This procedure is found to extract all the phosphate, when the amount of the original solution is not more than 100 cc. in the case of an HCl extract. For soil extracts containing much silica it is necessary to heat the residue from the evaporation for two hours at 120° to 160° , the silica interfering otherwise with the subsequent manipulations.

"To the solution prepared as above, 25 cc. of the concentrated ammonium nitrate is added and the mixture brought to 55° . Twenty-five cc. of the ammonium molybdate, previously brought to the same temperature, is then added and the mixture stirred, allowed to cool, and filtered after standing two hours. The supernatant liquid is decanted through a filter paper and the precipitate washed by decantation several times with a 2 per cent sodium nitrate solution; this solution prevents the deflocculation of the precipitate, which usually happens when distilled water is used alone. The washing is continued till the washings are no longer acid. The filter is then washed into the beaker with water and the precipitate dissolved in standard alkali and titrated back. For the precipitation it is found convenient to use a water bath kept at 55° , in which the beakers containing the solution are placed till they have acquired the temperature of the bath. The factor recommended for tenth-normal alkali is: 1 cc.=0.0003004 gm. P_2O_5 ."

Determination of carbon in soils and soil extracts, J. W. AMES and E. W. GAITHER (*Jour. Indus. and Engin. Chem.* 6 (1914), No. 7, pp. 561-564, fig. 1).—It is pointed out that the methods of estimating total carbon in soils by oxidation with a mixture of chromic and sulphuric acids have been tested

by Warrington and Peak^a and by Cameron and Breazeale (E. S. R., 15 p. 744) with varying results. As determinations of carbon were needed in 1 per cent hydrochloric acid and 4 per cent ammonia extracts of soils and the employment of neither the Parr calorimeter nor the combustion furnace was feasible, a thorough test of the chromic and sulphuric acid method was made and the results compared with those given by combustion with copper oxid in a furnace. In addition to this, combustions were made with alkaline permanganate solution with a concentrated chromic acid solution and continued boiling.

The soils gave figures which compare well with those yielded by ignition methods. Dilute mixtures of chromic acid and alkaline permanganate gave low results. The work seems to give conclusive proof that the concentrated chromic and sulphuric acid treatment completely decomposes organic and inorganic carbon present in soils and overcomes the objection raised by Cameron and Breazeale and Hall and Miller.^b

"If boiled for 30 minutes, a mixture of 3.3 gm. of chromic acid in 10 cc. of water to 50 cc. of sulphuric acid (sp. gr. 1.84) will oxidize all of the organic carbon and liberate all carbon dioxid chemically or mechanically held in soils, provided the soil is ground to pass 60-mesh sieve and from 1 to 3 gm. of soil used for each 60 cc. of mixture. The Brown and Escombe titration method of determining carbon dioxid, and the modified Amos absorption tower for the same, are applicable to either wet or dry combustion forms of apparatus, and can be relied upon to give rapid and accurate results with considerable economy of time and space. Carbon may be accurately determined in 1 per cent hydrochloric acid extracts and 4 per cent ammonium hydroxid humus solutions without concentrating below 50 cc. by using the above chromic and sulphuric acid mixture. The apparatus described is applicable to the determination of carbon dioxid in any form, and a number of other gas determinations, depending on absorption in acid or alkalis, oxidation, or reduction processes. By using the apparatus shown, and following the method as outlined, one analyst can run six determinations at one time, and complete a set an hour when doing routine work."

An improvement in the electrical method of determining salt in soil, W. BEAM and G. A. FREAR (*Cairo Sci. Jour.*, 8 (1914), No. 93, pp. 130-133, pl. 1).—In operating under field conditions with the electrical conductivity method it was found desirable to eliminate as far as possible the influence of calcium sulphate contained in the soil. This may be readily and satisfactorily done by employing, in place of water, diluted alcohol (40 per cent by volume) for the extraction of the salt, and by comparing with a table of resistance in the same solvent.

"Further, it is possible to extend the method to the determination of the proportion of calcium sulphate, since it is only necessary to make another extraction, with water, on a fresh sample, and from its conductivity and that of the salt known to be present, to determine the proportion of calcium sulphate by a simple calculation. An attached chart shows the curves of resistances of sodium chlorid in water, calcium sulphate in water, and sodium chlorid in alcohol of 40 per cent. The greater proportion of salt in most Nile soils is made up of sodium chlorid and sodium sulphate, but the resistances of these two are so nearly alike that for all practical purposes the one curve suffices.

"The method was tested on solutions of known composition, as follows: A water solution containing 0.03 per cent gypsum and 0.037 per cent sodium chlorid was found to have a resistance of 210 ohms as against a calculated resistance of 220 ohms. A water solution containing 0.015 per cent of gypsum and 0.018

^a Jour. Chem. Soc. [London], 37 (1880), pp. 617-625.

^b Jour. Chem. Soc. [London], 89 (1906), pt. 1, pp. 595-597, fig. 1.

per cent of sodium chlorid was found to have a resistance of 410 ohms as against a calculated resistance of 420 ohms."

A modified Kjeldahl flask for determining soil nitrogen, H. A. NOYES (*Jour. Amer. Chem. Soc.*, 36 (1914), No. 12, pp. 2541, 2542, fig. 1).—This modified flask is said to do away with the bumping and consequently makes a transfer unnecessary. The flask has the same proportions as the ordinary Kjeldahl bottles, but has a more pointed bottom.

Methods for the chemical, biological, and bacteriological examination of water, O. EMMERLING (*Praktikum der Chemischen, Biologischen und Bakteriologischen Wasseruntersuchung*. Berlin: Borntraeger Bros., 1914, pp. VII+200, figs. 171).—This work deals with the analysis of drinking water and other waters. In the chapter on the examination of mineral water the determination of radio-activity is included. The biological portion considers the examination of sediments (living and dead matter), while the bacteriological section gives general and special methods for detecting *Bacillus coli*, *B. anthracis*, *B. typhosus*, and the cholera vibrio. The interpretation of results of water analyses is also included.

Hypothetical combinations in water analysis, R. B. DOLE (*Jour. Indus. and Engin. Chem.*, 6 (1914), No. 9, pp. 710-714).—This paper discusses the present confusing condition in regard to the reporting of results of water analysis. It shows the advantages of reporting the results in ionic form.

Methods of estimating carbohydrates.—II, The estimation of starch in plant material, W. A. DAVIS and A. J. DAISH (*Jour. Agr. Sci. [England]*, 6 (1914), No. 2, pp. 152-168, figs. 1).—Continuing previous work (E. S. R., 32, p. 112), the authors conclude that "the Sachsse method" of estimating starch is unreliable in the case of plant material; not only does the presence of pentosans falsify the results, as pentoses are formed during the hydrolysis, but actual destruction of dextrose occurs during the prolonged treatment with dilute acid. O'Sullivan's method gives low results, owing to the loss of dextrin which occurs during the purification of the solution after the conversion by diastase."

"To estimate starch, the dry material (free from sugars and, if necessary, previously extracted with water to remove gums, amylans, etc.) is gelatinized with 200 cc. of water in a beaker flask heated for one-half hour in a water bath at 100° C. The solution is cooled to 38°, 0.1 gm. taka-diastase added, together with 2 cc. of toluene, and the mixture left 24 hours in order that the conversion may take place; it is then heated in a boiling water bath to destroy the diastase and the clear solution above the residual leaf material is filtered through a fluted filter paper into a 500-cc. measuring flask; the leaf residue is thoroughly washed several times by decantation, the washings being passed through the filter paper until the volume of liquid in the flask amounts to about 475 cc. The necessary quantity of basic lead acetate is then added to precipitate the tannins, etc., present in the solution; the amount required varies considerably with different leaves, generally ranging from 5 to 25 cc. A large excess of lead should be avoided and tests should be made after each small addition of lead acetate in order to ascertain when the precipitation is complete. When this is the case, the solution is made up to 500 cc. at 15° and filtered; 100 cc. of the filtrate is placed in a 110-cc. measuring flask, the slight excess of lead precipitated by adding solid sodium carbonate and the volume adjusted to 110 cc. at 15°. Fifty cc. of the filtrate from the lead carbonate is used for the reduction and another portion polarized in a 400-mm. tube.

The method of calculation is explained.

The chlorin number, a new constant for fat, A. ZLATAROFF (*Ztschr. Untersuch. Nahr. u. Genussmitl.*, 26 (1913), No. 7, pp. 348, 349).—The cumbersome procedure necessary for determining either the iodine or bromine numbers of fats led the author to study the value of chlorin as a fat constant. After studying a number of chlorin compounds and halogen transmitters, phenyliodid-chlorid, which can be easily and rapidly prepared, was chosen. The procedure used for determining the chlorin number was then as follows:

Weigh off 0.25 gm. of triolein (this was used in the test) in a Sendtner flask such as is used for determining the iodine number; mix with 60 cc. of carbon tetrachlorid, previously saturated at room temperature with phenyliodid chlorid prepared by Willgerodt's method,^a and allow the mixture to stand for four hours. In another Sendtner flask place 60 cc. of the phenyliodid-chlorid solution, and allow this also to stand for four hours. At the end of this time add 40 cc. of a titrated silver nitrate solution (1 cc.=0.0102 gm. silver) to each flask and shake. Then add a few drops of iron alum solution and determine the excess of silver nitrate with ammonium sulphocyanid solution (1 cc.=0.54 cc. silver-nitrate solution or 0.0515 gm. of silver). The difference between the two titrations represents the chlorin fixed by the fat.

For triolein the values fluctuated between 273 and 300.

The quantitative estimation of the salt-soluble proteins in wheat flour, G. A. OLSON (*Jour. Indus. and Engin. Chem.*, 6 (1914), No. 3, pp. 211-215).—Continuing previous work (E. S. R., 31, p. 208) and with a view to finding a correct method for the estimation of edestin and leucosin proteins in flour, it was found that a 1 per cent solution of sodium chlorid extracts gliadin to the extent of approximately 29 per cent of the total proteins present, while a 10 per cent solution extracts it to the extent of only 5 per cent.

A method is described whereby the edestin and leucosin nitrogen determination can be made in flour and its products, a correction being applied for the gliadin extracted.

"The amount of nitrogen bodies extracted with salt solutions and directly coagulated by heat varies with the concentration of the solvent. The 10 per cent concentration gives higher results than were found possible with a 1 per cent salt solution."

An investigation of the presence of furfural in cider vinegar, AGNES A. ANDERSON (*Jour. Indus. and Engin. Chem.*, 6 (1914), No. 3, pp. 214, 215).—Pure cider vinegar may contain furfural as a natural constituent; therefore its presence can not be taken as indicating that either wood acetic acid or caramel has been added. Cider vinegars may give a test for caramel by the Ronnet method without containing furfural or added caramel; hence the method is not reliable.

The analysis of maple products.—III, The range of variation of analytical values in genuine maple sirups, J. F. SNELL and J. M. SCOTT (*Jour. Indus. and Engin. Chem.*, 6 (1914), No. 3, pp. 216-222).—Continuing the work previously noted (E. S. R., 31, p. 611), the author reports the results of examining 126 samples of genuine Canadian maple sirup. The range of conductivity value, in these sirups is determined for 20° and 25° C., and the range of the various analytical values in genuine maple sirups is compared with reference to these results and to those of Bryan (E. S. R., 24, p. 266), Jones (E. S. R., 17, p. 1038), and McGill (E. S. R., 26, p. 661).

"The values of narrowest range are the conductivity value, the alkalinity of the soluble ash, the weight of the total ash, and the Winton lead number. A scheme of rapid analysis is proposed, embracing determinations of the afore-said values and of the Canadian lead number."

^a Jour. Prakt. Chem., 33 (1886), No. 1-2, pp. 154-160.

The reductase (fermentation reductase) test, R. DONS (*Centbl. Bakt. [etc.]*, 2. Abt., 40 (1914), No. 1-8, pp. 132-153; *abs. in Berlin. Tierärztl. Wchnschr.*, 30 (1914), No. 22, p. 388).—The author concludes that the reductase test can not serve as a substitute for the counting (plating) of micro-organisms. In the decolorization of the dye the organisms grown at 38° C. were very active, and the results varied with pure cultures according to whether raw, pasteurized, or sterilized milks were tested. He believes that the micrococci and streptococci which form lactic acid probably decide the outcome of the reductase test. Bacteria of the coli aerogenes group reduced methylene blue as rapidly as true lactic acid bacteria, but more slowly in milk which had been pasteurized and sterilized. The test, however, will not decide how many bacteria are present. Bacteria which do not grow at 38°, or do so only sparingly, reduce methylene blue only when they are present in large numbers. An addition of human or horse feces to ordinary milk did not (even in large amounts) influence the reductase test when the milk had stood for two hours after adding the excrement.

Milk which had been heated for a long time at 100° or for a short time at 135° was capable of reducing methylene blue. Milk heated 10 minutes at 68 to 70° still produced the reductase test as in raw milk. The presence of a small amount of methylene blue in milk will check the development of bacteria, and the use of the reductase test in conjunction with the fermentation test was not tested by the author because it seemed to be of no value from a hygienic standpoint.

Manufacture and use of unfermented grape juice, G. C. HUSMANN (*U. S. Dept. Agr., Farmers' Bul.* 644 (1915), pp. 16, figs. 14).—"It is the purpose of this publication to state briefly the way in which unfermented grape juice is made and preserved, both for commercial and domestic use, as well as the fundamental processes and principles involved, and to offer practical suggestions." The subject is dealt with under the following headings: Composition of the grape; analyses of grape must; causes of fermentation; methods of preventing fermentation; flavor and quality of grape juice; home manufacture of grape juice; valuable appliances for home use; commercial methods of making must; and the use and food value of unfermented grape juice. A few thoroughly tested recipes prepared with unfermented grape juice are included.

Some abnormal factors of so-called farmers' cider vinegars, J. C. DIGGS (*Jour. Indus. and Engin. Chem.*, 6 (1914), No. 3, pp. 215, 216).—This gives the results of examining 18 samples of cider vinegar which were entered in an apple product exhibit of an apple show held in Indiana.

"The results of these analyses show the uncertainty of unscientific methods in the manufacture of vinegar. Pernicious practices exist among farmers who put vinegar on the market. Fraudulent vinegars are often sold as farmers' cider vinegars."

Hop investigations (*Oregon Sta. Rpt. 1913-14*, pp. 17, 18).—From a study made of the chemical changes of hops due to treatment with sulphur dioxide fumes the following conclusions are drawn:

"There is nothing to indicate that sulphuring in the bleaching process affects the bitter resins. The resin of the 'sulphured' hop contains no sulphur. The sulphur dioxide does not combine with the essential oil of the hop. The 'unsulphured' hop contains sulphur in the sulphate form, but no sulphur which is volatile by the ordinary steam distillation. Different samples of 'sulphured' hops contain different amounts of sulphur, both total and volatile with steam. There seems to be no definite proportion between the volatile sulphur and the total sulphur. The amount of sulphur present in the unsulphured Oregon hop is practically constant. The analytical methods which have been in use for the

estimation of the amount of 'sulphuring' are unreliable. Methods for determining quantitatively the different forms in which sulphur is found in the 'sulphured' hop have been worked out." See also work previously noted (E. S. R., 29, p. 534; 30, p. 115).

METEOROLOGY.

Report of the chief of the Weather Bureau, 1914 (*U. S. Dept. Agr., Weather Bur. Rpt. 1914*, pp. 256, pls. 4).—This contains an administrative report on work during the fiscal year ended June 30, 1914, and includes also tables giving a general summary of the weather conditions in the United States by months during the year 1913, an annual summary of climatological data at the Canadian stations for 1913, a list of observing stations and changes therein during 1913, sunshine in 1913, details of excessive precipitation in 1913, monthly and annual meteorological summaries for 1913, monthly and annual amounts of precipitation in 1913, and monthly and seasonal snowfall in 1913-14.

The administrative report notes, among other things, the inauguration during 1914 of a new special service for reporting the daily weather conditions over the principal range region of the West as affecting the live stock interests; the extension of snow surveys at high altitudes in some of the western States with reference to water supply, and of the use of a new form of snow scale or stake for this purpose; the extension of observations to secure better data for forecasting frosts in the citrus districts and in the orchards of the Northwest; and the improvement of the flood warning service.

Monthly Weather Review (*Mo. Weather Rev.*, 42 (1914), Nos. 11, pp. 611-646, pls. 8; 12, pp. 647-702, pls. 43).—In addition to weather forecasts and river and flood observations for November and December, 1914, lists of additions to the Weather Bureau Library and of recent papers on meteorology and seismology, the weather of the month, a condensed climatological summary, and climatological tables and charts, the numbers contain these articles:

No. 11.—Remarks on the Nature of Cyclones and Anticyclones, by J. Hann; Halos and Precipitation at Wauseon, Ohio, by J. M. Kirk; Light Pillars, by Pernter and Exner; Halos, by C. S. Hastings; Systematic Explorations of the Upper Air with Estimates of Cost, by M. W. Harrington; Extracts from the Annual Report of the Smithsonian Astrophysical Observatory; The American Meteor Society, by C. P. Olivier; The Drexel Aerological Station; A Method for Classifying Winters, by A. Angot; Washington and Paris Winters, by C. Abbe, jr.; A Method for Classifying Summers, by A. Angot; Drought at New York City, by C. D. Reed; Notes on Ice and Mercury; and Meteorological Observations in Germany.

No. 12.—Solar Radiation Intensities at Washington, D. C., During October, November, and December, 1914, by H. H. Kimball; Photometric Measurements of Daylight Illumination on A Horizontal Surface at Mount Weather, Va., by H. H. Kimball; Heat from the Stars; E. Kron on the Extinction of Light in the Terrestrial Atmosphere in the Region of the Ultraviolet, by W. Schmidt; Present Status of Our Knowledge of the Causes of the Diurnal Changes in Temperature, Pressure, and Wind, by J. M. Pernter; Thunder, by W. Schmidt; The Place of Forestry Among Natural Sciences, by H. S. Graves; Why Some Winters are Warm and Others Cold in the Eastern United States, by W. J. Humphreys (see p. 811); Do Clouds Yield Snow Easier than Rain? by D. F. Manning; Foreign Distribution of the *Monthly Weather Review* during 1914 and 1915, by C. F. Marvin; Floods in New England Rivers, by A. J. Henry; and Seismology, by W. J. Humphreys. This number also contains a new section on seismology containing seismological reports for October, November, and December.

Why some winters are warm and others cold in the eastern United States, W. J. HUMPHREYS (*Mo. Weather Rev.*, 42 (1914), No. 12, pp. 672-675).—Among the general facts and conclusions of this paper are the following:

"(1) Some winters in the eastern United States are unusually mild and others exceptionally cold. (2) During mild winters this part of the country temporarily has a marine climate, during cold ones a continental climate. (3) The type of winter climate, marine or continental, in this section is largely determined by the presence or absence of the Bermuda 'high.' (4) Persistence, during winter, of the 'Bermuda 'high' gives to the eastern United States a marine and, therefore, for it, an unusually mild climate. Continued absence of this 'high' during winter, allows a continental climate and, therefore, exceptionally low temperatures, to extend quite to the Atlantic coast. (5) The cause of the Bermuda 'high' seems to be a cold-water surface, a minimum surface temperature, along the belt of highs. (6) This low surface temperature in the region of the Bermudas may depend upon the temperature and strength of the Labrador current."

Predicting minimum temperatures for frost protection, J. W. SMITH (*Ohio Nat.*, 15 (1915), No. 3, pp. 405-408, fig. 1).—This article explains a method by which the fruit grower can closely estimate the probable minimum temperature at critical periods. The method is based upon the average afternoon median temperature. Explicit rules to follow in the use of the method under different conditions are given.

Climate and meteorology of Australia, H. A. HUNT (*Off. Yearbook Aust.*, 7 (1901-1913), pp. 59-85, figs. 9).—As in previous years (*E. S. R.*, 30, p. 511) the more important meteorological and climatic features of Australia are described, and detailed data for temperature, pressure, precipitation, evaporation, and other phenomena for 1912 and preceding years are tabulated.

SOILS—FERTILIZERS.

Soil erosion in the South, R. O. E. DAVIS (*U. S. Dept. Agr. Bul.* 180 (1915), pp. 23, pls. 9, fig. 1).—This bulletin discusses the conditions affecting soil erosion as observed in a field study through the States of Virginia, Tennessee, Missouri, Mississippi, Alabama, Georgia, South Carolina, and North Carolina.

It is stated that owing to climatic, economic, and soil conditions, and the type of agriculture practiced, the South is especially susceptible to excessive erosion. "Methods of prevention should be practiced wherever hilly land is used for crops. Terracing is the best and most efficacious method, but should be supplemented by deep plowing and the incorporation of organic matter when permissible. The agricultural problem involves the adoption of proper crop rotation in connection with preventive methods best suited to soil conditions and crop production. The reclamation of eroded land is possible, but requires careful attention and patience. The use of such land for forestry is commonly advisable. Nature effects reclamation, but the process is slow and tedious."

See a previous note by the author (*E. S. R.*, 31, p. 316).

Analysis of Florida muck soils, R. E. ROSE (*Ann. Rpt. State Chem. Fla.*, 1914, pp. 27-33).—The results of analyses of saw grass muck soils of the St. John's Valley, in St. Lucie County, are discussed with observations on the fertility of Everglade soils in general.

Geography of the soils of Georgia, F. A. MERRILL (*Ga. State Normal School Bul.*, pp. 13, figs. 3).—This bulletin discusses the geographical distribution of the soil-forming rocks of the State of Georgia.

In the Appalachian highlands argillaceous and calcareous shales and limestones abound, the former producing red and brown loams and the latter a gray

gravelly soil. In the Piedmont Plain the rock formation is crystalline, consisting mainly of granites, gneisses, and schists, from which are produced soils consisting mainly of gray sands of a gravelly nature, interspersed with many beds of red clay. In the Atlantic Coastal Plain the rocks are mainly cretaceous formations and later sediments, and consist of unconsolidated clays, sands, and marls.

Composition of the soils of the different glacial drift sheets, F. J. ALWAY (*Minnesota Sta. Rpt. 1914, pp. 48, 49*).—It is stated that physical and chemical analyses of samples of virgin soils from ten of the most southerly counties of Minnesota so far indicate that the phosphorus and potassium contents and the physical properties affecting the supply of moisture do not exhibit radical differences. As regards lime content, the soils of the eastern counties are sharply distinguished from those of the western counties, as the former "carry a very small amount of lime throughout the first 3 ft., while the latter, with certain exceptions, carry very large amounts in the third foot, considerable in the second foot, and some of them large amounts even in the first foot."

Soil survey of Orange County, New York, G. A. CRABB and T. M. MORRISON (*New York Cornell Sta. Bul. 351 (1914), pp. 747-800, fig. 1, map 1*).—This survey, made in cooperation with the Bureau of Soils of this Department, deals with the soils of an area of 533,760 acres in southeastern New York, the topography of which ranges from nearly flat or rolling to mountainous. The entire county has been glaciated. The drainage is through the Hudson and Delaware Rivers.

The soils of the county are divided with reference to manner of formation into glacial residual, reworked glacial, recent alluvial, cumulose, and cumulo-alluvial soils. Forty types are mapped, of which the Dutchess silt loam and stony loam are the most extensive and most used for general farming and dairying. Muck is said to be the most valuable land in the county. Many of the soils, especially the muck and other bottom soils, need drainage.

The adaptation of soils to crops is recognized to some extent, but little effort is made to develop systematic crop rotations.

Soil analysis (Oregon Sta. Rpt. 1913-14, p. 19).—Analyses of samples of different types of soil occurring in the Hood River Valley revealed a marked nitrogen deficiency in many cases and occasional deficiencies in potash and lime.

The distribution of swamp land in the Kingdom of Bavaria (*Übersicht über die Verteilung der Moore im Königreich Bayern. Munich: C. Gerber, 1913, pp. 11, pl. 1*).—Data and a map are given showing that the total swamp land surface, including upland and lowland swamps, amounts to about 510,329 acres, of which about 95,687 acres are under cultivation.

Studies of an acid soil in Assam, A. A. MEGGITT (*Mem. Dept. Agr. India, Chem. Ser., 3 (1914), No. 9, pp. 235-269, pls. 7; abs. in Jour. Chem. Soc. [London], 106 (1914), No. 626, I, p. 1212*).—In field experiments with oats on an acid alluvial light loam soil deficient in calcium carbonate and phosphoric acid, on which crops had repeatedly failed to survive the seedling stage, it was found that the application of lime made it possible to grow crops on the soil and that the lime was particularly effective if used in sufficient amounts to make the surface soil neutral or slightly alkaline.

Since applications of sodium, potassium, and magnesium carbonates also had more or less the same favorable influence on crop growth as liming, the author suggests that the beneficial effect may be attributable in part at least to neutralizing of soil acidity or the supplying of lacking basic constituents in the soil.

Since laboratory examinations "had already disclosed positively the presence of an acid organic compound, definitely toxic to jowar [*Andropogon sorghum*]

seedling plants in extremely dilute culture solution (30 parts per million), the toxicity of which was partly or wholly negated by the addition of a complete nutrient solution containing nitric nitrogen, or by the addition of lime to neutrality," it was thought to be reasonably clear that the soil's infertility was due in no small part to the presence of toxic organic compounds which accumulate in acid soils deficient in basic constituents. This conclusion was further confirmed by the fact that the application of superphosphate was followed by beneficial effects on crop growth similar to those observed in the case of liming, and that the toxicity to sorghum seedlings observed in water cultures with extracts of the soil was diminished by the addition of phosphate, although it is recognized that the results with the superphosphate may have been due in part to the fact that it supplied a deficiency of phosphoric acid in the soil.

The colloid chemistry of humus, S. ODÉN (*Kolloid Ztschr.*, 14 (1914), No. 3, pp. 123-130; *abs. in Ztschr. Angew. Chem.*, 27 (1914), No. 88-89, *Referatenteil*, pp. 613, 614).—Studies of the humus of sphagnum peat in which the principles of colloid chemistry were used in an attempt to isolate the individual constituents of humus are reported.

Three substances, two of which were colloidal and one noncolloidal, were obtained from the water extract of the peat. Also substances exhibiting distinctly colloidal properties were obtained from the ammonia extract. Tests of some of these as regards electrical conductivity indicated the presence of active acids which are thought to be the main constituents of humus acids. Further tests of the electrical conductivity of a solution of pure humus in very dilute ammonia verified these results. The author considers this to be conclusive evidence as to the existence of humus acids.

A note referring to similar work by Ehrenberg and Bahr is appended.

— Soil colloids and the soil solution, F. K. CAMERON (*Jour. Phys. Chem.*, 19 (1915), No. 1, pp. 1-13).—The author comments on the loose use of the term colloid as applied to soil chemistry, reviews the arguments of others advanced to demonstrate the existence of colloids in soils, and attacks the popular theories regarding the supposed relations between soil phenomena and soil colloids on the grounds that they have no definite experimental basis.

He points out that many of the soil phenomena attributed to soil colloids can be accounted for by the mere fact that the soil particles present a large surface for absorbent action. He is of the opinion, however, that soil chemistry can be considered a branch of colloid chemistry provided a colloid is defined as a phase sufficiently divided where surface phenomena are predominant.

"The relation of the gas-liquid surface tension to the solid-liquid surface tension is a most important problem requiring investigation for a clear purview of the functions of soil colloids. It is a necessary consequence of the colloid constitution of the soil that very small changes in the concentration of the soil solution correspond to relatively large changes in the composition of the solid phases respecting those constituents derived from the minerals of the soil."

Soil water in relation to plant growth, W. J. COLEBATCH (*Jour. Dept. Agr. So. Aust.*, 18 (1914), No. 4, pp. 363-374).—The author discusses the functions of soil moisture, with particular reference to plant growth in excessively wet soils.

Experiments on the effect of varying water and food supplies on the water requirements of oats showed that plants do better in dry seasons when the food supply is plentiful and that in dry years a portion of the manure is lost to the crop. Further experiments with oats on the influence of water supply on the effectiveness of phosphates bore out the conclusion that the water supply exerts an important influence on the effectiveness of fertilizers.

The author further discusses gravitational water and soil drainage, reviewing the work of others bearing on the subject and pointing out particularly the importance of soil drainage in regulating the soil moisture content, soil aeration, soil temperature, and the physical condition of the soil.

Effects of variations in moisture content on certain properties of a soil and on the growth of wheat, F. S. HARRIS (*New York Cornell Sta. Bul. 352 (1914), pp. 805-868, fig. 1*).—The work of others relating to the subject is briefly reviewed and greenhouse and laboratory experiments with wheat plants grown in pots containing clay loam soil subjected to different moisture and fertilizer treatments, and studies of certain properties of cropped and uncropped soils standing for long periods under these conditions are reported.

It was found that the cropped soil was more compact than the uncropped and the volume of the soil decreased as the moisture content increased. Fertilized soils with crops were more compact than unfertilized soils. Flocculation was greater in cropped than in uncropped soils and was greater with a medium degree of soil moisture than with a very large or very small degree, the least flocculation occurring in the very wet soil. Flocculation was increased by fertilizers, especially those containing little sodium nitrate. The nitrate content was always greater in uncropped than in cropped soil and in soils to which nitrate fertilizers had been added, and was greater with 30 per cent moisture than in a drier or a wetter soil. Soil constantly saturated with moisture contained practically no nitrates. The nitrite content of the soils was always low but was higher in the uncropped soil than in the cropped, and was higher where high nitrogen fertilizers had been added. The ammonia content, while never great, was always higher in cropped than in uncropped soils, was highest where a high nitrogen fertilizer was used, and was not much affected by the soil moisture. The ratio of soluble salts to nitrates was always higher in cropped than in uncropped soil.

While not definitely determined, the number of bacteria in the soil was usually greater with 15 than with 30 per cent moisture and was slightly greater in unfertilized than in fertilized soil. The easily soluble phosphoric acid was always higher in the uncropped than in the cropped soil, higher in the fertilized than in the unfertilized soil, and varied irregularly with the soil moisture.

Wheat matured sixteen days earlier with 20 per cent moisture than with either 11 or 45 per cent and a well-balanced fertilizer caused an earlier maturity than one with high nitrogen or no fertilizer. Tillering was promoted by high moisture and by fertilizers. Plants were able to stand excessive moisture better when young than when older and mildew attacks were severest on plants growing with high moisture and a high nitrogen fertilizer.

"The number of nodes per culm was least with a medium, and most with the very high, soil moisture. The length of culms and of heads increased with the moisture up to 37½ per cent, after which both decreased. The heads were proportionately longer in the dry than in the wet soil. The quantity of moisture during the early growth, more than at any other time, determined the head as well as the culm length. Fertilizers increased the number of nodes per culm, as well as the length of culm and of head." The number of kernels of wheat per pot and the quantity of straw increased with the fertilizers, and with the soil moisture up to 37½ per cent, above which it decreased. The number of kernels per head was greatest on the soil with a medium amount of moisture but the weight of 100 kernels was greatest on the very dry soil and least on the very wet. There was proportionately more grain than straw when the soil moisture was low during the early stages. Proportionately more of the dry matter in wheat had been produced by the boot stage in the dry soil than

in the wet, after which the weight of roots which could be washed out decreased to maturity. The greatest transpiration was in the plants producing the most dry matter. In relation to dry matter produced, water was transpired most economically with a medium degree of soil moisture but was used most economically in the production of grain when the soil was kept comparatively dry up to the boot stage and then kept wet until maturity. The total dry matter in the plant as a whole, however, was produced most economically when the soil was kept wet until the five-leaf stage and drier from then until maturity.

The percentage of nitrogen in both grain and straw was highest on the driest soil and gradually decreased as the moisture increased up to 37½ per cent, but as the soil approached saturation the percentage of nitrogen in the grain slightly increased. The condition that gave the highest percentage of nitrogen both in the grain and straw was where the moisture was low up to the boot stage and high from that stage to maturity. The lowest nitrogen was found where the moisture was high during all periods. The high nitrogen fertilizer always increased the nitrogen content of the crop. While the percentage of nitrogen was not so great in the crop produced with complete fertilizer as with no fertilizer, the total weight of nitrogen was much greater, due to the larger crop. The decrease in the percentage of nitrogen from the boot stage to maturity was greater in the crops on the wet soil than in those on the dry soil.

The percentage of crude ash, calcium, magnesium, potassium, and phosphoric acid was lower in wheat straw grown with high moisture than in that grown with low moisture.

"These experiments bring out clearly the facts that the moisture relations of plants are greatly affected by the fertility of the soil, and that the effect of a fertilizer is dependent on the amount of soil moisture. They emphasize also the fact that fertilizer experiments, in order to be of value, must be made under widely varying moisture conditions, and that experiments with the use of moisture by plants, in order to be conclusive, must include a number of fertility conditions."

A list of references to related literature is appended.

The evaporation of water from soil, B. A. KEEN (*Jour. Agr. Sci. [England]*, 6 (1914), No. 4, pp. 456-475, figs. 8).—Studies on water evaporation from the fine sand and clay soil fractions, from china clay, and from soils, with particular reference to the factors governing evaporation in soils, are reported and the apparatus and methods used described.

It was found that the evaporation of water from the soil fractions, from china clay, and from ignited soil is a phenomenon readily explainable by the known laws of evaporation and diffusion. In the soils, on the other hand, the evaporation was more complex, indicating the presence of a factor which causes a more intimate relation between the soil and the soil water. The removal of the soluble humus from the soil by means of 2 per cent caustic soda did not appreciably affect the evaporation, and ignition of the fine sand and silt made no appreciable difference in the evaporation from these fractions, thus largely eliminating any possible effect of the insoluble organic matter. Destruction of the colloidal properties of the clay fraction completely altered the evaporation curve, which became identical with that given by sand or silt.

It is concluded, therefore, "that the colloidal properties of the clay fraction are in part, if not mainly, responsible for the characteristic shape of the evaporation curve from soil."

In a mathematical study of the rate of evaporation from soil (the first differential of the experimental curves) two factors were distinguished which oper-

ated over practically the whole range of water content dealt with in the experiments, one expressing the effect of the gradually diminishing water surface on evaporation and the other giving an empirical measure of the influence of the vapor pressure of the moist soil. The following equation for rate of evaporation from soil was developed:

$$A \frac{dw}{dt} = \sqrt[3]{\left(\frac{ws}{100} + 1\right)} [2.303 \log_{10}(w+K) - \log_e K], \text{ where } \frac{dw}{dt} = \text{rate of evaporation.}$$

w = percentage of water present by weight.

s = specific gravity of the soil.

A and K = constants.

Partial sterilization of soil by volatile and nonvolatile antiseptics, W. BUDDIN (*Jour. Agr. Sci. [England]*, 6 (1914), No. 4, pp. 417-451, figs. 4).—Supplementing previous experiments by Russell and Hutchinson and others (*E. S. R.*, 31, p. 27) further tests were made by the Russell and Hutchinson method on two soils, one high and the other low in nitrates, to compare a wider range of substances including benzene, toluene, cyclohexane, pentane, hexane, heptane, chloroform, ether, acetone, formaldehyde, alcohols, phenol, cresol, hydroquinone, pyridin, calcium sulphid, sulphur, sulphur dioxid, sodium fluorid, and sodium chlorid. The object of these tests was to determine whether the phenomena observed in the earlier experiments in the case of toluene and a few other substances are generally true of antiseptics, including (1) those which are completely volatile and disappear entirely from the soil when their work is done and (2) those which remain in the soil for a considerable time or else leave decomposition products and so exert a prolonged action upon the bacterial flora of the soil and upon the plant.

It was found that the characteristics of true partial sterilization are common to a large number of antiseptics, and consist in an initial decrease in bacterial numbers followed by a large sustained increase, the killing of protozoa and nitrifying organisms, an initial increase in ammonia followed by a considerable increase in the rate of ammonia production, and no change in the results obtained following an increase in the dose in any particular chemical when once true partial sterilization has taken place. True partial sterilization was obtained only with the easily volatile or removable antiseptics, the dose of the more important of these necessary for this purpose being as follows: Benzene, below 0.15 per cent by weight of dry soil; toluene, 0.09; cyclohexane, 0.17; pentane, 0.7; hexane, 0.17; heptane, 0.1; chloroform, below 0.24; ether, below 1.5; and acetone, 5.8.

"Substances not completely removable from the soil have some lasting influence on the flora. With the weaker doses two or three special species of bacteria characteristic of the chemical used multiply temporarily to an enormous extent, but the organisms do not produce ammonia, consequently there is no gain in ammonia and nitrate as the result of their action. The higher doses permanently suppress all microbiological action in the soil.

"It appears to be a general rule that a simple flora can attain extraordinarily high numbers, while a complex flora, such as prevails after normal partial sterilization, does not attain to higher numbers than the comparatively low level of about five times those in the untreated.

"It is possible to trace a certain relationship between the action of all the substances used. The intensity of the effects shades off gradually from that of the powerful nonvolatile antiseptics through cresol and formaldehyde to the more and less potent volatile antiseptics respectively, till finally the action of merely spreading out the soil in a thin layer is reached [see abstract below]."

The author concludes that "volatile antiseptics are undoubtedly effective in increasing the productive capacity of a soil under laboratory and pot culture house conditions, but are unsuitable for application on the larger scale. An efficient solid substance would be very convenient in use and probably much cheaper than methods of partial sterilization by heat." The experiments thus far made "have not revealed any suitable new nonvolatile substance. They have, however, emphasized the value and explained the action of phenol and cresol and have emphasized, although they have not explained, the action of formaldehyde" in causing an initial increase in ammonia but an irregular inhibition of nitrification.

Note on the increased nitrate content of a soil subjected to temporary drying in the laboratory, W. BUDDIN (*Jour. Agr. Sci. [England]*, 6 (1914), No. 4, pp. 452-455).—In the course of the experiments noted above it was found that the untreated soils, spread out at the same time the treated soils were spread to evaporate the antiseptics, contained after a period of incubation considerably more nitrate than similar soils which had been kept permanently moist. The soils originally contained only a little more ammonia and nitrate than the moist soil and when dried contained less rather than more bacteria. This increased amount of nitrate "appears to be due not to absorption from the atmosphere but to the formation of more nitrate from the residues in the soil in spite of the fact that the numbers of bacteria are not increased."

These results are considered important in that they show the necessity of spreading the untreated soil side by side with the treated to avoid error in all work with volatile antiseptics.

Ammonification studies with soil fungi, H. C. McLEAN and G. W. WILSON (*New Jersey Stas. Bul.* 270 (1914), pp. 3-39, fig. 1).—Ammonification studies using dried blood and cotton-seed meal with an acid gravelly loam and a neutral red shale as media are reported, the main purpose being to determine the ammonifying efficiency of the fungi present in the soil. Preliminary experiments on the effect of acid phosphate and acid phosphate and lime on ammonia accumulation in soils and on the effect of acid phosphate on the ammonification of dried blood by bacteria indicated that fungi rather than bacteria were responsible for the large accumulations of ammonia in soils containing acid phosphate and organic nitrogen in the form of dried blood.

In a series of ammonification experiments with pure cultures of fungi, it was found that of the fungi studied, including members of the Aspergillaceæ, Mucoraceæ, Dematiaceæ, and Moniliaceæ, all had the power of ammonifying both cotton-seed meal and dried blood. Fungi belonging to the Moniliaceæ were the most active ammonifiers.

"The individual members of this group showing the highest ammonifying efficiency were *Trichoderma koeningi* strain v. 2 and *T. koeningi* strain v. 3. The latter fungus gave the maximum ammonia accumulation in the soil of any fungus studied, from both cotton-seed meal and dried blood. The highest ammonia accumulation was from the dried blood. The Aspergillaceæ contained the species showing the least ammonifying power. . . .

"Where dried blood was used as a source of nitrogen, acid phosphate was found to increase the ammonia accumulation in the soils with 18 out of the 26 pure cultures of fungi studied. On the other hand, where cotton-seed meal was added as a source of nitrogen, ammonia accumulation was increased only in the case of 8 out of the 25 cultures used in the test. . . .

"All of the fungi with the exception of four, viz, *Zygorrhynchus vuilleminii*, *Rhizopus nigricans*, *Monilia sitophila*, and *Mucor hiemalis*, were able to ammonify dried blood more readily than cotton-seed meal. The results of these experiments make it appear that the ammonification of the soil organic matter, by fungi, depends not only upon the chemical and physical composition of the

soil, but also upon the quality of the organic matter present, as well as on the presence of soluble phosphates."

A contribution on the nitrogen problem, H. SCHEERLINCK (*Handel. Vlaamsch Natuur en Geneesk. Cong.*, 17 (1913), pp. 192, 193).—A study carried out with a diplococcus, abundant in certain soils and water therefrom, is held to show that during the process of fermentation organic nitrogen takes part in the formation of ammonia.

Soil bacteriological investigations (*Oregon Sta. Rpt. 1913-14*, pp. 18, 19).—It has been found that lime seems to increase the ammonifying and nitrifying efficiency of the soils of western Oregon in a marked manner. The effect is less noticeable on eastern Oregon soils.

[Soil inoculation] (*Oregon Sta. Rpt. 1913-14*, pp. 19, 20).—Direct benefit was derived in 69 per cent of the cases in which cultures of bacteria, sent out by the station in 1912 for the inoculation of legumes, were used.

The results of some experiments with farmyard manure, R. A. BERRY (*West of Scot. Agr. Col. Bul. 65* (1914), pp. 177-251, figs. 4).—Experiments extending over a number of years on the storage of manure under cover and in the field, on the storage of different kinds of fresh manure in heaps in the field, on the treatment of manure during storage, and on times and methods of applications of manure, and comparing fresh *v.* rotted manure and large *v.* small applications of manure are reported.

When stored for four months in well trodden heaps the indoor manure lost 17.5 per cent in weight and the outdoor manure 20.6 per cent, with an average annual rainfall of 39.32 in. The indoor manure lost 20.4 per cent of its nitrogen and practically none of its phosphoric acid and potash, while the outdoor lost 28.4 per cent of its nitrogen, 21.1 of its phosphoric acid, and 28.3 of its potash. The rotted manures were in each case poorer in total and available nitrogen than the fresh, the losses in this respect being greater in the outdoor than in the indoor manure. The greatest loss was in ammoniacal nitrogen, amounting to from 70 to 80 per cent of that of the fresh manure, 18 per cent of the total nitrogen of which was in ammoniacal form. There was a slight increase of amid and of insoluble nitrogen in the rotted manure. There was no loss of phosphoric acid and potash where there was no drainage. The average increase of crop (potatoes and turnips) in favor of manure stored under cover was 7 per cent.

The average loss in weight of horse manure with peat moss and with straw litter, cow manure, steer manure, and pig manure stored in the open for four months (December to March) was 22.3 per cent. With the moss litter the loss from horse manure was much less than with straw (12.6 and 14.9 per cent, respectively). The two fresh manures richest in nitrogen, namely, those from fattening steers and from horses (with peat moss litter), were left poorer in this constituent after rotting, while the fresh manures relatively poor in nitrogen, namely, those from cows, pigs, and horses (with straw litter) in the order named were left slightly richer in total nitrogen after rotting. In the rotted manure on the average 4 per cent of the total nitrogen was ammoniacal and 82 per cent insoluble as compared with 15 and 72 per cent, respectively, in the fresh manure. Forty-four per cent of the phosphoric acid and 71 per cent of the potash in the rotted manure was soluble in water as compared with 53 and 76 per cent, respectively, in the fresh. "The average loss of manurial constituents in the five manures during rotting was: Total nitrogen, 29.6 per cent; total phosphoric acid, 12.2 per cent; total potash, 33.5 per cent." Rotting in every case lowered the fertilizing value of the manure as measured by its power of supplying available fertilizing constituents. This was borne out by experiments with potatoes and turnips.

"Of the substances added to the manure to fix ammonia, gypsum and sodium acid sulphate were the most efficient, but superphosphate of lime, kainit, and carbonate of lime increased the loss of nitrogen. Of the antiseptics added to check fermentation, chloroform acted best, followed by bleaching powder and formalin. The reduction in the loss of nitrogen, where such occurred, was, however, not sufficient in any case to repay the cost of the substance used. The most effective method of preserving the manure from losses of nitrogen was to trample the manure and to cover it with a 3-in. layer of soil."

Fresh and rotted manure was applied broadcast and in drills in autumn and spring on two rotations, (1) potatoes, wheat, grass, and oats, and (2) turnips, barley, grass, and oats, with the result that fresh manure applied in drills in the spring gave uniformly the best results both with the root crops and for the whole rotation. "About 9 per cent of the increase for root crops of the drilled manures was due to the method of applying the manure in drills over that of broadcasting. In the case of the autumn application of manure, when the manure was applied to turnips, there was a 5 per cent increase in favor of plowing in the manure at once compared with leaving the manure on the surface some time before plowing it in. When the manure was applied to potatoes there was not much to choose between the two practices." In the potato rotation about 50 per cent of the total increase due to the manure was accounted for in the first crop (potatoes) and the manurial residue was not exhausted at the end of the rotation. In the case of the turnip rotation 65 per cent of the total increase was accounted for in the first crop (turnips) and the manurial residue was practically exhausted by the second crop. "Farmyard manure yields, when applied in drills in spring to potatoes, about 60 per cent, and to turnips about 80 per cent, of its total manurial value for the rotation, compared to a yield of about 40 per cent with potatoes and about 50 per cent with turnips when the manure is applied broadcast in the autumn. Small dressings of manure, of about 10 tons, produce proportionately a better return with the first crop than large dressings of about 20 tons, but the latter leaves proportionately a larger residue than the former."

From comparative tests of fresh *v.* rotted manure applied at rates of 20 tons per acre in drills in the spring it was concluded that the relative efficiency of the manures depends largely upon the amount of available nitrogen which they are capable of yielding to the crop, although, as a rule, short rotted manure produces better results on light soils than long fresh manure. Large applications (20 tons per acre) of manure to potatoes left a manurial residue in the soil which produced a notable increase on the fourth crop following the application of the manure. With turnips the residual effect was hardly visible after the second crop. Small applications (10 tons per acre) produced no effect after the second crop. The addition of superphosphate, potassium sulphate, and ammonium sulphate to the manure did not affect this result, showing that the artificial fertilizers were exhausted by the crop to which they were applied.

The article gives numerous analyses of different kinds of manure, especially a series of analyses of cow manure from 12 typical dairy farms which showed total nitrogen, 0.237 to 0.462, average 0.346 per cent; ammoniacal nitrogen, 0.024 to 0.129, average 0.064 per cent; phosphoric acid, 0.170 to 0.428, average 0.266 per cent; and potash, 0.263 to 0.497, average 0.381 per cent.

Results of two years' work on London Soil Experiment Field, G. ROBERTS (*Kentucky Sta. [Circ.], pp. 3*).—Comparative tests of different fertilizers on a rotation of corn, wheat, and cowpeas on a fine sandy loam, especially deficient in nitrogen, phosphoric acid, and calcium carbonate, but containing a fair proportion of potash, showed that the most profitable method of improving such a

soil is to use phosphate, limestone, and manure in connection with a crop rotation similar to that followed in the experiments reported.

The economic importance of peat moors and water powers, with special reference to the air-nitrogen question, A. BENETSCH (*Die volkswirtschaftliche Bedeutung der Torfmoore und Wasserkräfte unter besonderer Berücksichtigung der Luftstickstoff-Frage*. Berlin: F. Siemenroth, 1914, pp. V+229, pls. 7, figs. 17; abs. in *Ztschr. Moorkultur u. Torfverwert.*, 12 (1914), No. 5-6, p. 214).—This book is divided into a general introduction and three parts, dealing, among other things, with (1) the economic importance of peat and peat moors from both industrial and agricultural viewpoints, containing a discussion of the manufacture of illuminating gas and ammonia from peat by the Mond-Frank-Caro processes as well as the use of moor soils for agricultural purposes; (2) the development and use of water power, especially for the production of electric power; and (3) the electrical production of nitrogen compounds from the free nitrogen of the air, dealing also with the question of the production of nitrogenous and other fertilizers and discussing particularly the calcium cyanamid and nitrate industry as developed in different countries.

The author holds that the nitrogen question has been satisfactorily solved by the electrical fixation of atmospheric nitrogen.

A bibliography of 212 references to the literature of the subject as well as a list of German patents relating to the electrical fixation of nitrogen are given.

The utilization of peat in Italy, U. ROSSI (*Bol. Quind. Soc. Agr. Ital.*, 19 (1914), No. 10, pp. 356-361; abs. in *Internat. Inst. Agr. [Rome]*, *Mo. Bul. Agr. Intel. and Plant Diseases*, 5 (1914), No. 8, pp. 1005, 1006; *Mitt. Ver. Förd. Moorkultur Deut. Reiche*, 32 (1914), No. 20, pp. 375, 376).—It is stated that there are a large number of workable peat beds in Italy, and that some attempt has been made at different times with little commercial success to utilize the peat for fuel and other purposes and to use the peat land for agriculture.

The most important industrial development with reference to the utilization of peat is, however, the establishment of plants at Orentano and Codigoro for the manufacture of illuminating gas and ammonia by the Mond process. It is stated that these plants are able to manufacture ammonia at somewhat less than half the market price of this product.

German and other sources of potash supply, C. H. MACDOWELL (*Bul. Amer. Inst. Mining Engin.*, No. 98 (1915), pp. 103-114; *Chem. Engin.*, 21 (1915), No. 2, pp. 45-50).—The German deposits and mining methods are described, with data on cost, commercial conditions, and consumption. Other possible sources are also briefly discussed.

Among the latter are the deposits near Kalusz in Galicia, Austria, and the recently discovered deposits in Spain, which seem to be of commercial importance; deposits of nitrate of potash in Peru; the potash salts which may be obtained from sugar-beet waste, from wool scouring, and as a by-product in the manufacture of cement; the potash obtainable from kelp, alunite, feldspar, leucite, and from brines obtained from alkali lakes and ponds and from borings in Texas. As far as the United States is concerned, it is stated that "up to now Searles Lake is the only nearby producer on the map."

Further exploration and investigation of methods of utilizing the sources of potash named is urged.

Investigation of sources of potash in Texas, W. B. PHILLIPS (*Bul. Amer. Inst. Mining Engin.*, No. 98 (1915), pp. 115-127, figs. 3).—This article deals particularly with the potash brines obtained at Spur, Tex. (*E. S. R.*, 28, p. 522), and with the occurrences of small amounts of potassium and sodium

nitrate in sandstones and other rocks and of small amounts of nitrates derived from bat guano in caves.

The conclusion is that the only hopeful outlook for the existence of workable beds of potash salts in Texas is in the brines as found at Spur and in the almost wholly unknown region southeast of and bordering New Mexico.

Potash from kelp, F. K. CAMERON (*U. S. Dept. Agr. Rpt. 100 (1915), pp. 122, pls. 40, figs. 2, maps 54*).—This consists of a series of reports, accompanied by detailed maps of the kelp groves of the Pacific coast and islands of the United States and Lower California, on the following subjects: Pacific Kelp Beds as a Source of Potassium Salts, by F. K. Cameron; The Kelp Beds from Lower California to Puget Sound, by W. C. Crandall; The Kelp Beds of Puget Sound, by G. B. Rigg; The Kelp Beds of Southeast Alaska, by T. C. Frye; and The Kelp Beds of Western Alaska, by G. B. Rigg. These reports and maps are the result of careful surveys of all of the commercially available kelp beds from Cedros Island to Cape Flattery, about half the beds available in southeast Alaska, and the major part of the beds on the southern slopes of the Alaska Peninsula.

On the basis of a large number of analyses which show that the Pacific coast kelps, in a dry state, contain about 16 per cent of potash, corresponding to about 25 per cent of potassium chlorid, it is estimated that the 390 square miles of kelp beds already mapped on the Pacific coast are capable of producing annually 59,300,000 tons of fresh kelp, equivalent to 2,266,000 tons of potassium chlorid.

"What it would cost to obtain the pure potassium chlorid from kelp can not be stated, as sufficient experience is not yet accumulated to justify exact estimates. It should be easier to extract the potassium chlorid from kelp than from the Stassfurt salts. But the cost of harvesting the kelp as well as the subsequent manipulation is, at the present time, speculative. It is easy to show by 'paper calculations' enormous profits in obtaining pure potassium chlorid, iodine, and possibly other products from the kelp. Since, however, the dried kelp will average more than 25 per cent potassium chlorid, since the organic matter decomposes very readily, and there is present nitrogenous matter equivalent to about 2 per cent nitrogen and some phosphate, it seems probable that kelp in the dried state, either alone or in mixture with other materials, such as fish scrap and standard phosphate carriers, is the form in which it is most likely to find at first a market as a fertilizer.

"It is also impracticable to give any close estimate of the value of the possible kelp harvest. Assuming that all the potassium chlorid were extracted and marketed as such, the value at present prices would be approximately \$90,000,000, whereas if the crop were all reduced to dried kelp and sold at current figures for both potash and nitrogen content, the value would be in excess of \$150,000,000."

The general conclusion from the investigations already made is "that the commercial production of potash salts from American sources and in quantities sufficient to meet the growing needs of the Nation is quite practicable."

Radium as a fertilizer, C. G. HOPKINS and W. H. SACHS (*Illinois Sta. Bul. 177 (1915), pp. 389-401*).—Experiments by others on this subject are reviewed, and field experiments with corn and soy beans in which the radium fertilizer was used at rates furnishing 0.01, 0.1, and 1 mg. per acre are reported.

The soy beans followed the corn on the same land without additional application of the radium fertilizer. Of six trustworthy average results with corn, three were for and three against radium. Of eighteen averages with soy beans, nine were for and nine against radium. In all cases the average variation

from the check was so slight and so evenly distributed for and against "as to lead only to the conclusion that radium applied at a cost of \$1, \$10, or \$100 per acre produced no effect upon the crop yields either the first or second season."

Attention is called to the fact that even if the radium fertilizer were to increase the crop yields "the effect would be that of a stimulant and the increase would be secured at the expense of the soil. Thus the soil would not be enriched in fertility, but actually impoverished by such treatment."

Fertilizer inspection (*Maine Sta. Off. Insp.* 62 (1914), pp. 105-140).—Analyses of samples of fertilizers collected under the direction of the Commissioner of Agriculture of Maine during 1914 are reported with a summary of the requirements of the state fertilizer law. Notes are also given on the valuation of fertilizers, the question of the potash content of fertilizers for 1915 in view of the present shortage of potash, the use of farm manure, and certain special results of the fertilizer inspection, including a statement by A. M. G. Soule.

AGRICULTURAL BOTANY.

Plant breeding, L. H. BAILEY and A. W. GILBERT (*New York: The Macmillan Co., 1915, rev. ed., pp. XVIII+474, figs. 113*).—This is a revision of the work by Bailey, the fourth edition of which has been noted (*E. S. R.*, 17, p. 1144). The work of revision has been largely done by the junior author and considerable new material has been added, bringing the subject up to date. Appendixes are given defining the terms used, with a bibliography of important contributions to plant breeding that appeared between 1905 and 1912, and laboratory exercises to be used in conjunction with teaching plant breeding.

Oenothera grandiflora of the herbarium of Lamarck, H. DE VRIES (*Rev. Gén. Bot.*, 25 bis (1914), pp. 151-166, fig. 1).—The author concludes an account and discussion of his comparative study of preserved and of natural specimens made in 1895 and repeated in 1913, with the statement that since the time of Lamarck this species has been growing on the dunes near Liverpool in the same form as at the present, and that the original specimen described by Lamarck as *Oe. grandiflora* (the name having been changed by Seringe about 1828) agrees with the form now generally known as *Oe. lamarckiana*.

Experimental variations in *Tricholoma nudum*, L. MATRUCHOT (*Rev. Gén. Bot.*, 25 bis (1914), pp. 503-509, pl. 1).—It is stated that *T. nudum*, cultivated in darkness with normal humidity at 11° C. (51.8° F.), grows as vigorously as under natural conditions, but that it loses progressively certain of its characters, such as the violet pigment characteristic of the species and the gill sinus characteristic of the genus. These changes were noted in the specimens without exception, while the odor and other characters were not sensibly altered.

The presence of *Orobanche minor* on *Pelargonium zonale*, H. SCHEERLINCK (*Handel. Vlaamsch Natuur en Geneesk. Cong.*, 17 (1913), pp. 194, 195).—Having found *O. minor* on *P. zonale* (it having strayed, supposedly, from clover growing near) to present certain anomalies as regards color and structure, the author grew this parasite on *Geranium robertianum* and obtained somewhat similar peculiarities.

Parasitic specialization, F. HESKE (*Ztschr. Forst u. Jagdw.*, 46 (1914), No. 5, pp. 281-289).—This is mainly a theoretical discussion of some recent conclusions by several authors regarding the chemical relations between the hosts and the fungi, with their collaborating enzymes.

Chondriosomes in fungi, F. A. JANSSENS (*Handel. Vlaamsch Natuur en Geneesk. Cong.*, 17 (1913), pp. 141-148, fig. 1).—Giving some results of obser-

vations made on the forms, arrangements, distribution, etc., of chondriosome elements alleged to exist in yeasts and in fungi studied in early stages of development, the author states that chondriosomes are abundant in fungi and are characterized by much the same appearance and peculiarities as in animals and higher plants.

Morphology of the barley grain with reference to its enzym-secreting areas, A. MANN and H. V. HARLAN (*U. S. Dept. Agr. Bul. 183 (1915), pp. 32, pls. 8, figs. 7*).—A special study has been made of the barley grain with a view to improving its quality. The authors give a report on the morphology of the grain, having investigated it both at rest and in germination.

It is claimed that the integuments of the ripe barley, with the exception of the investing membrane of the nucellus, are only protective. The membrane surrounding the nucellus develops into a semipermeable membrane, which has remarkable selective powers. In the development of the barley grain the endosperm is said to develop earlier and more rapidly than the embryo. At maturity the starch is less dense about the periphery of the endosperm than in the center, and the epithelial layer is not functional until near maturity. The conversion of the endosperm is effected by enzymes secreted by the epithelial layer of the scutellum. The conversion proceeds from the proximal end toward the distal end, working more rapidly through the layers immediately beneath the aleurone layer. Cytase and diastase, it is claimed, must both proceed from the scutellum, and the proteolytic ferments most probably owe their origin to the same organ. Small-berried barleys were found to have a greater diastatic power, due to the secreting area being proportionately larger. The efficiency of conversion is said to depend upon the shape and composition of the grain and upon the relative quantity of diastase secreted.

The ideal barley grain, it is claimed, should be broadly oval with a scutellum extending well over the edges of the adjacent endosperm. If large yield of malt is desired, the size of the grain should be large. If diastase is the main consideration, the size of the grain should be smaller.

Direct absorption and assimilation of carbohydrates by green plants, L. KNUDSON (*Abs. in Science, n. ser., 41 (1915), No. 1048, p. 180*).—Confirming the work of Molliard and others (*E. S. R., 21, p. 126*), the author has found that a variety of plants are able to absorb and assimilate various sugars, including lactose. Lactose was found utilized by vetch, radish, and onion, but not by timothy. For maize the sugars in order of preference by the plant are glucose, levulose, cane sugar, and maltose, while for vetch they are cane sugar, glucose, maltose, and lactose. Experiments on the influence of concentration of sugar, and also of the influence of sugars in enzym production, are said to be in progress.

A preliminary study of the chlorophyll compounds of the peach leaf, H. S. REED and H. S. STAHL (*Abs. in Science, n. ser., 41 (1915), No. 1048, p. 180*).—Investigations were undertaken with special reference to the chlorophyll content of peach leaves, the trees producing which were affected by the disease yellows. The chlorophyll compounds were extracted and separated by the use of inactive solvents.

The diseased leaves were found to differ from healthy ones both in the quality and quantity of the chlorophyll derivatives extracted. Among the derivatives found in healthy peach leaves were chlorophyll *a*, chlorophyll *b*, phyto-rhodin, chlorophyllin, phæophytin, phæphorbid, methyl-phæophorbid, methyl-chlorophyllid, phytochlorin, carotin, and xanthophyll. As the disease advanced there was found to be a decrease in the quantity of chlorophyll and chlorophyll derivatives. The diminution of the green series was greater than that of the yellow-brown series.

Studies on lycopin and its relations with chlorophyll, W. LUBIMENKO (*Rev. Gén. Bot.*, 25 bis (1914), pp. 475-493).—The author has followed up work previously done, partly in association with Montéverdé (*E. S. R.*, 31, pp. 128, 520), investigating herein more particularly the relations of lycopin within plants.

The results of the investigation, the author states, showed a striking coincidence between the physiological conditions favoring the formation of lycopin and lycopinoids and those which favor the decomposition of chlorophyll. He regards them as products of a particular chlorophyll oxidation, occasioned probably by the activity of enzymes.

The absorption and excretion of electrolytes by *Lupinus albus* in dilute simple solutions of nutrient salts, R. H. TRUE and H. H. BARTLETT (*Abs. in Science, n. ser.*, 41 (1915), No. 1048, pp. 180, 181).—A study was made, by means of water cultures, of the behavior of seedlings of *L. albus* toward distilled water and simple solutions of salts containing ions regarded as essential to the normal nutrition of the higher green plants. The plants were kept in darkness and the absorption of ions from the solution measured in terms of electrical conductivity.

The plants were found to give up their salts to distilled water at a variable rate until death resulted from exhaustion. Solutions of potassium phosphate and potassium chlorid acted essentially like distilled water. In potassium sulphate and potassium nitrate a slight absorption phase was observed in the most favorable concentrations; otherwise the results differed little from those seen in phosphate and chlorid solutions. Sodium chlorid was found to affect permeability and growth essentially the same as potassium nitrate and potassium sulphate. In the most favorable concentrations of magnesium nitrate and magnesium sulphate there was a slight but clearly developed absorption phase, resulting in a net gain of electrolytes to the plant. A net loss took place in the more dilute solutions and in the greater concentrations toxic action developed. In calcium nitrate and calcium sulphate solutions all concentrations studied supported active absorption of electrolytes, and apparently enabled the plants not only to retain the salts already present but also to make net gains from the solutions.

The absorption and excretion of electrolytes by *Lupinus albus* in dilute solutions containing mixtures of nutrient salts, R. H. TRUE and H. H. BARTLETT (*Abs. in Science, n. ser.*, 41 (1915), No. 1048, p. 181).—Under conditions similar to those described above the authors grew seedlings of *L. albus* in graded solutions of pairs of nutrient salts. The results obtained showed that the gain or loss of the electrolytes by the plants was influenced by the antagonistic action of ions.

The process of anthocyanin pigment formation, R. COMBES (*Rev. Gén. Bot.*, 25 bis (1914), pp. 91-102).—Summing up results of recent studies (*E. S. R.*, 31, p. 128), the author states that pigmentation is a continuous process. In some cases red is formed from the first; in others the original product is yellow, and it may persist, or it may disappear wholly or partly with the production (from its own body or otherwise) of the red pigment. The greater part of the anthocyanin is thus formed in place, a small portion resulting from the transformation of yellow into red pigment.

Relation of transpiration to the composition of white pine seedlings, G. P. BURNS (*Abs. in Science, n. ser.*, 41 (1915), No. 1048, p. 181).—In continuation of work previously reported (*E. S. R.*, 30, p. 726) the author repeated experiments there described and in addition noted the effect of transpiration as influenced by one and two covers of cheese cloth. The seeds were sown in May and the first analysis made of seedlings gathered August 11.

The analysis showed that there was an increase in the percentage of protein and soluble ash through no shade, half shade, to full shade, the highest percentage of ash occurring in the full shade bed where the rate of transportation was very low. The effect of the cheese cloth screens was intermediate between no shade and half shade.

Function of water reserves, L. DU SABLON (*Rev. Gén. Bot.*, 25 bis (1914), pp. 459-473, figs. 4).—An examination of the aquiferous cells and tissues of several plants is said to show that such cells possess a nucleus and a protoplasmic layer in a living state, dead cells taking little part in the storing of water on account of the too great permeability of the walls. This property, however, fits them for taking up or getting rid of water where this is advantageous. Several classes of aquiferous cells are discussed in regard to their special adaptations, some such cells also aiding, supposedly, in the regulation of transpiration.

The translocation of materials in aging leaves, N. SWART (*Die Stoffwanderung in ablebenden Blättern. Jena: G. Fischer, 1914, pp. 118, pls. 5*).—This is a study of the transfer and transformation of materials, of color changes, and of the relations of these to leaf fall.

It is stated that during the process of leaf coloration a transfer of materials from leaf to stem occurs, also that during this period both plasma and nucleus remain intact in the leaf cells. It is held that death of leaves in a climate characterized either by periodicity or uniformity is regulated chiefly by factors which are apparently internal to the plant itself and which generally show a relation to the age of the plant.

Anatomical structure of roots under abnormal tension, P. JACCARD (*Rev. Gén. Bot.*, 25 bis (1914), pp. 359-372, figs. 7).—The author reports that in the species studied (elm, beech, ash, etc.), roots developing under unusual tensions are characterized by a greater development of the conducting system, by alterations in tissue structure and lignification, by changes in the proportion of woody parenchyma and medullary rays, and by an altered diameter, usually of woody elements, also their more regular arrangement and their longer persistence in the living state. It is thought that these may be correlatives of a more general and fundamental reaction to the conditions brought about by tension.

Effects of compression on root structure, M. MOLLIARD (*Rev. Gén. Bot.*, 25 bis (1914), pp. 529-538, pls. 2, figs. 7).—The internal changes produced in small roots by their growth under compression between the laminae of schistose rock in subsoil, are described, those noted in *Carlina corymbosa* and *Ænanthe crocata* being taken as fairly typical.

Cells developing under pressure are of inferior size. Living elements usually undergo relatively slight deformation, dead cells being much flattened. The elements of wood and bast develop generally parallel to the compression plane, the vessels also being much flattened. The secretory ducts do not differentiate normally, as the fibrous elements are partly or totally suppressed. Hyperplasia is noted at the extremities of the major transverse axis of the root.

Deformation of heath on the seashore, H. DEVAUX (*Rev. Gén. Bot.*, 25 bis (1914), pp. 133-149, figs. 5).—This contribution on the causes of bushiness deals with the phenomena studied in case of *Erica vagans* on the seashore, analyzing the direct and indirect effects of wind on growing portions and the responses of the plant as regards production, thinning, bending, and death of the shoots.

Monstrosities of germination in cauliflower and Savoy cabbage, M. DUBARD and A. URBAIN (*Rev. Gén. Bot.*, 25 bis (1914), pp. 203-216, figs. 6).—The authors have followed up work previously reported (*E. S. R.*, 29, p. 629) by removing

one or both cotyledons of cruciferous seedlings 10 days old. The resulting anomalies of development, external and internal, are described.

Injury to vegetation by coal tar and other vapors and protection therefrom, R. EWERT (*Ztschr. Pflanzenkrankh.*, 24 (1914), Nos. 5, pp. 257-273; 6, pp. 321-340, figs. 14).—The author gives a detailed account of the injury to vegetation due to the deposit and absorption of air-borne products from chemical works of various kinds at several points in Germany, with lists of plants found to be susceptible or resistant to these substances.

These effects, although not entirely uniform, are said to be easily distinguished by both external and internal indications from injury by smoke-borne products. A peculiar lacquered appearance was produced on the upper surface of the leaves of a number of economic plants, also frequently a rolling and crinkling of the laminae. Some showed discoloration over part or all of the surface, accompanied by the formation of a superficial cork layer. Fruit trees showed a decrease of product, and vegetables from this neighborhood (usually within 1,000 meters) quickly lost their turgor and fresh appearance when gathered for market. The production of these effects varied somewhat with the wind and precipitation or differences in the materials discharged.

Experiments under controlled conditions during three years, and in part already confirmed by those of 1914, gave generally similar results which are detailed. It appears that the degree of injury depends not alone upon the amount of materials present in the atmosphere but also upon heat or insolation and dryness. The lacquered appearance followed exposure after one or two days, and it was here also confined to the upper leaf surface. Spraying with water before exposure to the emanations did not protect the plants from injury. Blooms of fruit trees were injured by the presence of the products. Spraying with Bordeaux mixture of 0.5 per cent strength appeared more harmful than otherwise, a result contrasted with that previously noted under other conditions (E. S. R., 28, p. 247). The glossy appearance of the upper leaf surface seems to be at least partly due to the drying out, thinning, and flattening of the epidermal cells. In some cases a superficial cork layer was formed.

The precise chemical and physical action of these emanations is not yet settled. Interference with the protective functions of the epidermis is a probable element, as plants suffer more in dry and sunny weather, with a degree of recovery in shade and moisture which appears, however, to be greater than it really proves to be in the end.

Studies on smoke injury to vegetation in Ratibor-Plania, R. OTTO (*Ber. K. Lehranst. Obst u. Gartenbau Proskau*, 1913, pp. 116-118).—This is a brief discussion of the studies noted above.

The pathological action of tar on plants, F. VON GABNAY (*Centbl. Gesam. Forstw.*, 39 (1913), No. 11, pp. 497-504).—The author gives a brief account of injury to trees by tar used on the trunks as protection against the ascent of caterpillars. It is said to have involved not only the cambium but also the sap wood, extending also beyond the edges of the tarred area. This injury is ascribed largely to the exclusion of air, but partly also (as in case of injury to roots of trees standing near streets paved with wood blocks) to the action of salts and acids. Reports and views of other observers are also discussed.

The vegetation of south Florida, J. W. HARSHBERGER (*Trans. Wagner Free Inst. Sci. Phila.*, 7 (1914), pt. 3, pp. 189, pls. 11, figs. 2).—This is a monograph on the vegetation of Florida south of 27° 30' N. (exclusive of the Keys), dealing with the geography, physiography, geology, and phytogeography of this region, giving lists of plants as found in the various associations or formations, and concluding with a floristic and ecologic analysis of the region and a discussion of the evolution of each of the formations noted.

FIELD CROPS.

Forage plants and their culture, C. V. PIPER (*New York: The Macmillan Co., 1914, pp. XXI+618, pls. 8, figs. 62*).—This book, one of the Rural Text-Book Series, treats of the different species of plants that have been or may be grown in different parts of the United States. It includes chapters treating of the general subjects of preservation of forage, choice of forage crops, seeds and seeding, and meadows and pastures, and on the special subjects of the species of grasses, legumes, root crops, and miscellaneous herbs used as forage.

[Report of] department of agronomy (*Oregon Sta. Rpt. 1913-14, pp. 24-26*).—Trials of vetches have shown that smooth vetch (*Vicia sativa*) is superior to others for western Oregon. In corn breeding Minnesota 13 for silage and forage and Minnesota 23 for grain have, by selection, been made to meet Oregon conditions, yields ranging from 7.4 to 22.1 tons of silage and from 34 to 85 bu. of grain per acre, respectively, having been secured. Variety tests of soy beans, potatoes, wheat, oats, and barley are noted, as in the production of a superior quality of kale seed secured by selection. Thousand-headed kale is noted as being superior to marrow cabbage.

Extensive irrigation experiments covering six years are noted. "A careful study of the effect of irrigation on the soil itself shows that with careful handling as to crop rotation, cultivation, and judicious use of water the quality of the soil may steadily be improved, but with careless handling the quality may be greatly injured.

"Using one dollar, which the data show is the maximum total annual cost for each acre inch, corn has given an average profit of 50 cts. an acre inch, kale 75 cts., beets \$1.18, alfalfa \$1.75, beans \$2.86, clover \$2.87, carrots \$3.74, and potatoes \$7.63 for each acre inch of water applied. The mean profit for each acre inch as an average of all crops and including nearly 150 trials has been \$2.33. The average increase in yield by crops has been 54 per cent and the average depth of irrigation for each season 4.8 in."

Unsuccessful attempts at rice growing are noted.

The relation between the physical characteristics of soils and their grain-producing power, G. STEMPEL (*Landw. Jahrb., 46 (1914), No. 3, pp. 367-401, figs. 6*).—After reviewing the literature on this subject, the author gives in tabular form results of the production of oats, barley, and rye on many kinds of soil in Bohemia that have been analyzed. These figures were compiled from the report of the experiment station at Tabor.

Fertilizers and the production of cereals, PALLADIUS (*Prog. Agr. y Pecuario, 20 (1914), Nos. 878, pp. 452-456; 879, pp. 472-474; 880, pp. 487-490; 881, pp. 503-506; 882, pp. 519-521, figs. 8*).—In this article the author points out the relation of yields of cereals to the consumption of potash in the chief grain-producing countries of Europe, and gives results of tests carried on at various centers in Spain that show increased yields following the use of fertilizers, and especially the addition of potash to nitrogenous and phosphatic fertilizers for wheat, barley, oats, and rye.

The small grains in Tennessee, C. A. MOOERS (*Tennessee Sta. Bul. 112 (1915), pp. 9-30, figs. 9*).—This bulletin gives results of variety tests of wheat, barley, and oats covering a period of several years.

It is noted that the best varieties of wheat for Tennessee conditions were Kansas Mortgage Lifter and Fulcaster. In studying methods of selection for improvement it is shown "that the Poole [variety of] wheat could be separated into strains or varieties which had different yielding capacities. The continued selection of the largest and best heads resulted in a variety which yielded highest and was markedly different in general appearance from the variety

obtained by selection of the most inferior heads. . . . The results with the Fulcaster variety show that no difference in yield was obtained by either method of seed selection. . . . Also efforts to separate out strains by individual plant selections were without result. In short, the Fulcaster variety used in these experiments must have been a pure strain which was not capable of being changed by any of the methods used."

Winter barley is noted as being a useful crop for Tennessee, the varieties Tennessee and Union being the best yielders. Better yields were obtained with seeding the latter half of September. Red clover is noted as being successfully sown with early-seeded winter barley and winter oats. Spring barley has proved inferior to spring oats, but may be used as a nurse crop. Better yields of winter oats were obtained from September seedings than from later seedings. Spring oats were successfully sown with Kentucky blue grass in the fall as a protection for the young grass, as they winter-killed and were out of the way for the full development of the grass in the spring.

Turf, C. M. HUTCHINSON (*Agr. Jour. India*, 9 (1914), No. 4, pp. 366-383, pl. 1).—This article describes various treatments of lawns, both manurial and cultural. *Cynodon dactylon* seems to have been the most successful grass as a turf former. The successful application of sand at the rate of 150 lbs. to 100 sq. ft. of lawn, on soils that were inclined to bake or crack during dry weather, is noted.

Grading and baling Philippine fibers, H. T. EDWARDS (*Philippine Agr. Rev. [English Ed.]*, 7 (1914), No. 10-12, pp. 381-390, figs. 5).—This article describes the official standard grades, gives methods of determining them, and describes the baling and labeling of fibers as required in the fiber industry of the Philippines.

Description of the standard grades of abacá (Manila hemp), M. M. SALEEBY (*Philippine Agr. Rev. [English Ed.]*, 7 (1914), No. 10-12, pp. 402-410).—This article gives specific descriptions of each grade of the newly established standard for abacá for the Philippines. These descriptions are based upon color, cleaning, texture, and length, and include brown, seconds, current, midway, good current, superior current, prime, and extra prime.

The rejuvenation of depleted abacá fields, F. P. NICKLES (*Philippine Agr. Rev. [English Ed.]*, 7 (1914), No. 10-12, pp. 411-419, pls. 2).—This article describes improved methods of cultivating abacá that have been successfully tried at the La Carlota station and by some growers. These methods consist chiefly of clean cultivation and the use of cowpeas as a cover and green-manure crop.

Alfalfa farming in America, J. E. WING (*Chicago: Sanders Publishing Co., 1912*, pp. 528, pls. 20, figs. 5).—A treatise on the production and uses of alfalfa with special reference to the United States.

Alfalfa culture, P. J. JENNINGS, R. J. BURLEY, and W. H. FAIRFIELD (*Dept. Int. Canada, Irrig. Ser. Bul. 2* (1914), pp. 26, pls. 2, figs. 3).—This bulletin gives the results of successful attempts to grow alfalfa, especially under irrigation, in Alberta and Saskatchewan.

Alfalfa, W. T. CLARKE (*California Sta. Circ. 87, Reprint*, pp. 6).—The article previously noted (E. S. R., 29, p. 32) has been rewritten.

Fertilizer experiments with beans in the valley of Mexico, M. CALVINO (*Bol. Soc. Agr. Mexicana*, 38 (1914), No. 42, pp. 824-827, fig. 1).—This article describes a fertilizer experiment with beans in which the addition of 80 kg. per hectare (71.2 lbs. per acre) of sulphate of ammonia to a fertilizer consisting of sulphate of iron 100 kg., double superphosphate 80 kg., sulphate of potash 80 kg., and gypsum 260 kg. per hectare, produced an increase of 356 kg., and a total yield of 1,880 kg., of beans per hectare.

Bur clover seed; means of hastening their germination, J. F. DUGGAR and H. B. TISDALE (*Alabama Col. Sta. Circ.* 29 (1914), pp. 113-116).—This describes several methods of soaking and scalding seed burs of bur clover to hasten germination.

The most successful method was found to be that of soaking for four hours in water at room temperature and then scalding for one minute in boiling water (212° F.). In nine days 76 per cent of burs germinated by this method as against 8 per cent with neither soaking nor scalding. Directions for soaking large amounts of seed are included.

On the relation of the anatomical coefficients of maize to its heights and the nitrogen content of the kernel, S. MOSKVICHEV (*Zhur. Opytn. Agron. (Russ. Jour. Expt. Landw.)*, 15 (1914), No. 4, pp. 266-281).—In an examination of five varieties of maize, the data obtained in measuring the stoma of the upper and the fifth leaf (15 samples from each variety), the height of the plants, and the nitrogen content led to the conclusion that with an increase of cell size the height increased and the nitrogen content sank.

Effect of the submersion of corn, E. MARCHETTANO (*Coltivatore*, 60 (1914), No. 32, pp. 433-435, figs. 2).—This notes the abnormal development of the male and the female parts of maize as results, apparently, of planting in the submerged alluvial soils of Lower Friuli, where soil may be covered with water to a depth of from 15 to 20 cm. (5.6 to 8 in.) for several days.

Fertilizer experiments with maize, M. CALVINO (*Bol. Cámara Agr. Nac. Leon*, 4 (1915), No. 1, pp. 4-8).—This article describes experiments and gives results showing the value of bone meal, sulphate of potash, gypsum, sulphate of ammonia, and double superphosphate as fertilizers for maize in Mexico. It is noted that the increase in yields has returned from 200.65 to 321.55 per cent interest on the cost of the fertilizers in six months in these experiments.

The modern cultivation of corn, Z. DOMINGUEZ (*San Antonio, Tex.: Dominguez Corn Book Publishing Co.* [1914], pp. 351, pls. 4, figs. 249).—An English edition of the Mexican book entitled *Agricultura*, already noted (*E. S. R.*, 32, p. 131).

Cotton cultivation in the West Indies, W. NOWELL and H. A. BALLOU (*Imp. Dept. Agr. West Indies Pamphlet* 74 (1914), pp. 118, pl. 1, figs. 35).—Cultural methods are described.

[Cotton experiments], **G. G. MACDONALD** (*Rpts. Finance, Admin., and Condition Sudan, 1913, vol. 2, pp. 143-151*).—This report gives results of variety tests which show some American varieties to surpass the ordinary Egyptian varieties at the Tokar experimental farm. Spacing tests showed 70 by 80 cm. (27.6 by 31.5 in.) to be the most favorable spacing for the Assili type and 90 by 100 cm. for the Affili type. Pruning plants by topping those that showed a tendency to produce wood was found to increase the yield considerably.

Preliminary work with hybrids of cotton, J. HERRMANN (*Bol. Agr. [Sao Paulo]*, 15. ser., No. 6-7 (1914), pp. 559-578, figs. 8).—This discusses preliminary work and gives data in hybridizing Upland and Caravonica varieties of cotton at the Eliza station.

The influence of some chemical reagents on the sprouting of potato tubers, E. NICKLISCH (*Untersuchungen über den Einflusse einiger chemischer Agentien auf die Keimfähigkeit der Kartoffelknolle. Inaug. Diss. Univ. Erlangen, 1912, pp. 51*).—This describes experiments and gives the results of the use of sulphuric acid, hydrochloric acid, sodium chlorid, copper sulphate, carbon monoxid, and carbon dioxid.

Tubers were immersed in solutions of these chemicals of concentrations of 0.5, 1, 2, 3, and 4 per cent for periods of 6, 12, 24, and 48 hours. On the basis of his observation of the vegetative conditions of the tubers, the author con-

cluded that the strong solutions of sulphuric acid and of copper sulphate suppressed sprouting for the longer periods, and growth was almost entirely prevented in the hydrochloric acid series. The weaker concentrations of sulphuric acid and hydrochloric acid somewhat retarded sprouting and later development of the sprouts. Carbon dioxide seemed to delay sprouting, but it was hastened by the action of sodium chlorid and carbon monoxid.

Group classification and varietal descriptions of some American potatoes, W. STUART (*U. S. Dept. Agr. Bul. 176 (1915), pp. 56, pls. 19*).—In order to aid the student and grower of potatoes, the author has in this bulletin classified known varieties into eleven groups, each named from the most typical well-known variety in the group. A key, describing the tubers, sprouts, and flowers of each group is presented, followed by detailed group descriptions and a list of varieties belonging thereto. Varietal descriptions of varieties, arranged alphabetically, occupy the bulk of the bulletin.

Improvement of the seed potato, G. MARTINET (*Ann. Agr. Suisse, 15 (1914), No. 2, pp. 242-253, figs. 10*).—This article notes variations due to apparent grafting of underground stocks and to selections.

Utilization of potatoes in Europe, R. P. SKINNER (*U. S. Dept. Com., Spec. Cons. Rpts., No. 64 (1914), pp. 8-15, 18, 19, 33-44*).—These pages contain data compiled from reports of consular officers in European countries, especially Germany, showing the development of the potato industry and the value, costs, and uses of products manufactured from potatoes, starch, alcohol, and dried potatoes. Reference is made to the opportunities of American farmers in manufacturing potato products.

On the pollination and crossing of rice, S. IKENO (*Ztschr. Pflanzenzücht., 2 (1914), No. 4, pp. 495-503, figs. 2*).—This article discusses the method of opening of the rice flower, and notes observations confirming the work of earlier investigators that rice seldom, if ever, cross-pollinizes in nature. The results of reciprocal crosses between a variety of common rice and one of a glutinous type show the colors and endosperm characters to mendelize in the F_2 generation.

The correlative relations of the internodes of a stalk to itself and the determination of the stalk structure as a guide in selection of nonlodging cereals, demonstrated with rye, H. PLAHN-APPIANI (*Ztschr. Pflanzenzücht., 2 (1914), No. 4, pp. 461-494, figs. 2*).—This article gives the results of tests of bending and breaking stresses of rye straw in full lengths and in internode by internode lengths.

[Soy beans], N. GILL (*Ann. Rpt. Kumaun Govt. Gardens, 1913-14, pp. 2-4*).—This article gives the results of tests with several varieties of soy beans on soils, the chemical and physical analyses of which are given. The data show yields, oil percentage, moisture, ash content, and weight of 100 seeds.

Spacing experiments in sugar beet cultivation in Hungary in 1913, B. VON JANCsó (*Österr. Ungar. Ztschr. Zuckerindus. u. Landw., 43 (1914), No. 5, pp. 685-694*).—Reports from 16 centers at which beets were spaced 8 and 10 in. apart in rows spaced from 14 to 18 in. apart showed the most favorable results by spacing 8 by 14 in., as compared with 10 by 14 in. the preceding season (*E. S. R., 31, p. 334*). It is noted, however, that 8 by 16 in. and 10 by 14 in. gave nearly as good results as the 8 by 14 in. It is stated that this was a very favorable season for the development of the sugar beet in Hungary.

Drilling fertilizer experiments with sugar beets in Hungary in 1913, J. GYÁRFÁS (*Österr. Ungar. Ztschr. Zuckerindus. u. Landw., 43 (1914), No. 5, pp. 675-684*).—This continued previous work (*E. S. R., 30, p. 529; 32, p. 230*) and with similar results. The effect of drilling superphosphate and nitrate of soda,

combined and singly, was to increase germination of beet seeds and hasten early development. The superphosphate seemed to improve the root development and the nitrate the leaf development.

[Seedling canes and manurial experiments], J. P. D'ALBUQUERQUE and J. R. BOVELL (*Barbados Dept. Agr., Rpt. Sugar-Cane Expts. 1912-1914, pp. 4-82*).—This reports the progress of work in manurial experiments and variety tests with seedling canes, previously noted (*E. S. R.*, 30, pp. 340, 835).

It is noted "that all the plats that received sulphate of ammonia gave an increase over the no-nitrogen plats, and that the most favorable result of the application of nitrogen in any form was obtained on the plat that received 60 lbs. of nitrogen as sulphate of ammonia, 15 lbs. in January and 45 lbs. in June. The plats receiving nitrogen as dried blood, to the extent of 40 or 60 lbs. nitrogen, with one anomalous exception showed an increase on the no-nitrogen plat, but not so great as in the best sulphate of ammonia plats. The results of the nitrate of soda plat must be rejected as unreliable. The results of the phosphate series show that all the plats that received phosphate either in the form of superphosphate or basic slag, gave smaller yields than the no-phosphate plats. With two exceptions all the potash plats show an increase on no-potash and the best result of the series was given by the plat that received 80 lbs. of potash as sulphate of potash (about 160 lbs. sulphate of potash) applied all in January."

Results of productivity tests of artificial hybrids, natural hybrids, self-fertilized seedlings, seedlings obtained from selected seeds, and varieties of ratoon plantings carried out at many centers on both black and red soils, are given in tabular form. It is noted that variety B. 6450 has as usual given satisfactory results in comparison with the standard White Transparent. The average yield of this variety over the standard, both plants and ratoons on black and red soils, is given as 6.5 tons of canes per acre for the season 1912-1914.

[Fertilizers on sugar cane], H. T. EASTERBY (*Ann. Rpt. Bur. Sugar Expt. Stas. [Queensland], 1914, pp. 30, 31*).—Experiments with different forms of nitrogenous manures, including dried blood, sulphate of ammonia, nitrolime, nitrate of ammonia, and nitrate of soda, applied to sugar-cane plant crop at the rate of 100 lbs. of nitrogen per acre, gave 8.5, 7.9, 7.8, 7.4, and 7.3 tons of sugar per acre, respectively.

Experiments and observations on *Helianthus annuus*, F. A. SATSYPEROV (*Trudy Būro Prikl. Bot. (Bul. Angew. Bot.), 7 (1914), No. 9, pp. 543-600, figs. 2*).—This discusses work with the sunflower of Russia carried on during 1912, 1913, and 1914 at the experiment station in the Government of Voronezh. Notes cover the development of the stem, leaf, inflorescence, flower, fruit, and abnormalities. Some work is described in the inheritance of the characters of armored layer of cells beneath the subepidermal tissue, black-violet pigment in the subepidermal tissue, and the pigment in the epidermis which gives the seeds a striped appearance.

Sweet clover, C. C. CUNNINGHAM (*Kansas Sta. Circ. 44, pp. 10, figs. 3*).—This gives cultural methods and uses.

Sweet clover, I. S. COOK (*West Virginia Sta. Circ. 14 (1915), pp. 7, figs. 5*).—This gives cultural methods and uses of this plant under West Virginia conditions.

Deli tobacco, a mixture of races, based on differences in leaf-breadth, J. A. HONING (*Meded. Deli-Proefstat. Medan, 8 (1914), No. 6, pp. 155-174*).—This article gives measurements of tobacco leaves from the harvest of 1913 and 1914 from differently bred lines of Deli tobacco and discusses the results.

Report on experiments on the manuring of turnips in 1909, 1910, and 1911, J. WYLLIE (*West of Scot. Agr. Col. Bul.* 60 (1912), pp. 17-39).—This reports results in testing commercial fertilizers for turnips in the central and southwestern counties of Scotland. The following conclusions are given:

"Where farmyard manure is not applied, the use of both potassic and nitrogenous manures for turnips is to be recommended, but of the two the former are more essential and more likely to yield high money returns. Kainit and potash manure salts are about equally efficacious. . . .

"The relative efficacy of $\frac{1}{2}$ and 1 cwt. nitrate of soda as a top-dressing, along with $\frac{1}{2}$ cwt. sulphate of ammonia in the drills, varies very much, and the chances are slightly in favor of the $\frac{1}{2}$ cwt. dressing proving the more economical. Contrary to popular opinion, $\frac{1}{2}$ cwt. nitrate of soda in the drills gives, in the majority of cases, a better result than $\frac{1}{2}$ cwt. top-dressed, the chances being about 3:2 in favor of the drill application. Also, $\frac{1}{2}$ cwt. nitrate of lime in the drills gives, in the majority of cases, a better result than a similar amount top-dressed.

"As a top-dressing for turnips, nitrate of lime is at least equal, and in many cases the superior, of nitrate of soda. For drill application, nitrolime is, on the average, about equally efficacious to sulphate of ammonia [and nitrate of lime].

"The best nitrogenous dressing for turnips varies very much according to local conditions."

Correlation and variability relations in a constant square-head variety of wheat, W. OETKEN (*Ztschr. Pflanzenzucht.*, 2 (1914), No. 4, pp. 445-460, figs. 2).—To study these relations in practical breeding, the author considered the characters, length of stalk, stooling, thickness of spike, and 1,000-kernel weight as they appeared in the first generation from selections of extremes of these characters. From the data obtained, he was forced to admit his inability to formulate any general ratios of correlations or variabilities.

The flowering and pollination of some forms of spring wheat, T. SHITKOWA (*Zhur. Opytn. Agron. (Russ. Jour. Expt. Landw.)*, 15 (1914), No. 3, pp. 155-180).—The results of the study, during 1912 and 1913, of varieties of wheat representing the forms *Lutescens*, *Erythrospermum*, *Hordeiform*, and *Græcum* in regard to the opening of the flowers and anthers, show a wide variation in different seasons, due, apparently, to climatic conditions, and also in the time of day of the same variety, often causing failure in pollination. The author concludes, therefore, that the different forms of the same agricultural plant behave very differently in regard to their flowering and pollination and that any one kind must be handled with extreme care.

Spacing, depth of seeding, and tillering in spring wheat, O. D. RABOMNOVA (*Zhur. Opytn. Agron. (Russ. Jour. Expt. Landw.)*, 15 (1914), No. 5, pp. 371-394).—Two varieties of spring wheat, *Triticum vulgare erythrospermum* and *T. durum hordeiforme*, were spaced to have 12.5, 25, 50, 100, and 200 sq. cm. per plant (1 sq. cm.=0.155 sq. in.). Yields per plant were found to be largest when grown in the largest space, but the quality of the grain was considered inferior. Per surface unit, however, the reverse was observed. The best spacing for *T. durum* seemed to be 100 sq. cm. and for *T. vulgare* 12.5 sq. cm.

In studying the influence of depth seed was planted 2 (0.787 in.), 4, 6, 8, and 10 cm. The best germination was secured at the most shallow depth. Tillering was found to begin later with the deeper plantings, but the growth period was shorter so that all heads matured uniformly. No difference in yield was observed at the different depths, but the shallow-planted seeds produced grain of greater 1,000-kernel weight. At the 2-cm. depth the tillering nodes were formed at the seed, while at greater depths these nodes were formed

above the seed and near the surface of the soil. The seeds planted 10 cm. deep are noted as having three tillers.

Wheat production in Georgia, J. R. FAIN and P. O. VANATTER (*Ga. State Col. Agr. Circ.* 6 (1914), pp. 4).—This circular notes the production of wheat in Georgia. The results of tests from 1909 to 1914 show yields ranging from 18.33 to 32.91 bu. per acre with an average of about 25 bu.

Washington wheats, E. G. SCHAFER and E. F. GAINES (*Washington Sta. Bul.* 121 (1915), pp. 3-16, figs. 2).—This bulletin describes fifteen varieties of wheat grown in Washington, and gives yields of field and nursery tests of numerous varieties for the years 1911, 1912, and 1914. Tables show the percentage of flour produced and of wet gluten, dry gluten, and nitrogen contained in the wheats studied.

The best variety in the test as to both yield and quality is noted as being Hybrid 128, a cross between Jones Winter Fife and Little Club. The average yield for this variety for the three years mentioned was 43.8 bu. per acre.

Nitrogen content of the wheats of southeastern Russia, N. TULAİKOV (*Iuzh. Russ. Selsk. Khoz. Gaz.*, No. 9 (1913), p. 6; *abs. in Zhur. Opytn. Agron. (Russ. Jour. Expt. Landw.)*, 14 (1913), No. 4, p. 401).—This article gives results of experiments that indicate the influence of the concentration of the soil solutions as affecting the nitrogen content of wheat. It is stated that by increasing the soluble salts, but not changing the moisture content in the soil in which the wheat was grown, the nitrogen content of the grain was increased considerably.

A new sterilization stopper and method of storing seeds by the use of wire gauze and cotton, M. PLAUT (*Ber. Deut. Bot. Gesell.*, 32 (1914), No. 7, pp. 466-471, figs. 3).—A method is described for covering glass bottles or other containers with a layer of cotton under wire gauze to allow for aeration in storing seeds.

Seed inspection (*Maine Sta. Off. Insp.*, 64 (1914), pp. 153-164).—The chief requirements of the Maine seed-inspection law are given, methods for testing seeds at home are described, and results of seed inspection for 1914 are given in tabular form showing nearly 1,300 samples as being practically up to the guaranty of purity.

Forty years of seed-control work, M. HEINRICH (*Landw. Vers. Stat.*, 85 (1914), No. 3-4, pp. 269-357, pl. 1).—This article reviews the work of the seed-control station of Rostock, giving tabulated data and discussions of important species handled since 1874, when 116 seed samples were examined. The number in 1913 reached 3,028.

Thirty-sixth report of the Swiss Seed Control and Experiment Station at Zurich, F. G. STEBLER (*Landw. Jahrb. Schweiz*, 28 (1914), No. 2, pp. 187-209).—This gives the results of seed examinations of 12,702 samples from 199 kinds, and briefly reviews the experimental work with field crops.

Weeds of barley fields in the forest area of European Russia, A. I. MAÏTSEV (*Trudy Bûro Prikl. Bot. (Bul. Angew. Bot.)*, 6 (1913), No. 12, pp. 825-962).—This discusses the immense damages to the barley industry caused by weed seeds, and lists and describes the different weeds of several Governments of European Russia, giving results of analyses of samples that show the percentage of weed seeds by weight and by number.

HORTICULTURE.

How to send living plant material to America, D. FAIRCHILD (*U. S. Dept. Agr., Bur. Plant Indus., How to Send Living Plant Material to America* [1914], pp. 3, pls. 6).—This circular contains directions with illustrations of the proper

methods of preparing seeds, cuttings or scions, and rooted plants for shipment to America with the view of avoiding the dangers of introducing diseases and to insure arrival of the material in a vigorous growing condition.

The use of hotbeds and cold frames on the farm, A. L. DACY (*West Virginia Sta. Circ. 13 (1915), pp. 16, figs. 4*).—The author points out the advantages of hotbeds and cold frames, and gives directions for their construction and management.

The farmer's vegetable garden, H. O. WERNER (*North Dakota Sta. Circ. 5 (1915), pp. 18, figs. 4*).—A popular treatise on vegetable gardening with special reference to the production of a home supply. In addition to general cultural directions brief notes are given on the culture of the more common vegetables, including information on storing and canning.

The results of variety tests of early, midseason, and late cabbage during 1914, together with a planting table for North Dakota conditions, and a short bibliography of literature on vegetables are appended.

Inheritance and selection by vegetative propagation of garlic (*Allium sativum*), P. VOGLER (*Jahrb. St. Gall. Naturw. Gesell., 53 (1913), pp. 102–146, figs. 9*).—The principal results of this investigation have been noted from another source (E. S. R., 30, p. 738). In addition, the author here concludes that selection within a strain based on plus or minus variants is of no value. Modified characters are not inherited through vegetative propagation.

Orchard and garden spraying, H. L. CRANE (*West Virginia Sta. Circ. 12 (1914), pp. 4*).—This comprises a spray calendar for the treatment of the more common insect pests and diseases of fruits and vegetables, together with instructions for preparing solutions.

Spraying calendar for 1915, A. L. MELANDER and D. C. GEORGE (*Washington Sta. Popular Bul. 77 (1915), folio*).—This calendar contains concise descriptions of the pests and diseases of various orchard fruits, together with instructions for their treatment. Information is also given relative to the preparation of different solutions.

[Report on the] section of fruit breeding (*Minnesota Sta. Rpt. 1914, pp. 37–40*).—In the section of fruit breeding special emphasis was given during the season to the study of inheritance in clonal varieties. The results thus far secured, here briefly stated, show that the inheritance of characters in the F_1 generation in clonal varieties of plums is not constant, as is ordinarily expected in Mendelian phenomena. The results to date of the sterility investigations with strawberries and plums show that the nuclei of mature pollen in both the plum and strawberry are abnormal, degenerated, and disorganized in many of the sterile or partially sterile varieties. Careful study is being made of the plum hybrids at the fruit breeding farm. These include crosses between several species such as *Prunus triflora* \times *P. americana*, *P. besseyi* \times *P. americana*, the apricot \times sand cherry, *P. simonii* \times *P. triflora*. As thus far observed some of the hybrids between *P. americana* and *P. triflora* appear to be self-sterile.

A special study has been made of the general question of hardiness in fruits. The percentage of winterkilling in strawberries, based on observations of several hundred different crosses during the previous winter, varied from a perfect stand to as high as 60 per cent. Most of the varieties stood the winter well, but there was a marked difference in the percentage of killing under practically similar field conditions. Some of the crosses between *P. americana* and *P. triflora* have proved hardy, and certain of the crosses between the Burbank and Wolf and the Abundance and Wolf have proved sufficiently hardy to suffer no injury from winters such as 1911–12. The results of the hardiness tests of these hybrids show in general that when a semihardy variety is crossed with a hardy variety the progeny inherit resistance to cold in different de-

grees. A list is given of new plums, grapes, raspberries, and strawberries that have been produced in connection with the work of breeding hardy fruits and have been sent to the trial stations for testing.

Pruning, O. M. MORRIS (*Washington Sta. Popular Bul.* 79 (1915), pp. 32, figs. 42).—In part 1 of this bulletin the author gives directions for pruning various fruit trees, the subject matter being based upon a study of pruning practices employed by the successful fruit growers of the State. Part 2 discusses the fundamental principles involved in the more common pruning practices, consideration being given to the influence of pruning on growth, heavy pruning of the top, pruning the roots, pruning trees to shape the top, variety types, pruning to induce fruit production, season of pruning, treatment of wounds, ties, and props.

Effect of various dressings on pruning wounds of fruit trees, G. H. HOWE (*New York State Sta. Bul.* 396 (1915), pp. 83-94).—Experiments were started at the station in 1911 and conducted for four years to determine whether any coverings are necessary for wounds of trees, as well as the effect on the trees of various substances used in treating wounds. The trees used in the experiments were apples and peaches and the substances used as coverings were white lead, white zinc, yellow ocher, coal tar, shellac, and avenarius carbolineum. The dressings were applied when the pruning was done at different seasons of the year and upon wounds of various ages.

From the results of this experiment as a whole it is concluded that the dressings commonly applied to pruning wounds retard rather than accelerate the healing of the wounds. The effects are the same whether the dressings are applied when the wounds are made or some weeks later when the cut surface has dried out. The effects of the dressings used are so injurious to peach wood that wounds on peach trees should never be covered. For sprayed orchards at least it appears unnecessary to apply dressings to wounds under four or five in. in diameter to prevent the entrance of fungi. It remains to be proved whether dressings have any real value in covering large wounds. The injury caused by dressings probably offsets or even overbalances any possible protection against decay.

Of the materials used shellac was the least injurious and seemed to exert a stimulating influence upon the wounds for the first season. Shellac adhered to the wounded surfaces least well of all. Avenarius carbolineum and yellow ochre caused so much injury that they should never be used as dressings. Coal tar in addition to causing injury disappeared rapidly, either through absorption or evaporation. Tissues injured by using white lead and white zinc practically recovered from the injury by the end of the second season. Of the protective substances used white lead is considered to be the best.

Pruning wounds need no protection, F. H. HALL (*New York State Sta. Bul.* 396, popular ed. (1915), p. 1).—A popular edition of the above.

Soils of Massachusetts and Connecticut, with especial reference to apples and peaches, H. J. WILDER (*U. S. Dept. Agr. Bul.* 140 (1915), pp. 73, pls. 23).—In this bulletin the author gives a general description of the surface features, soil material, and climate in different parts of southern New England. The development of orchards on suitable soils and the kinds of soil on which several of the different varieties of apples and peaches may be expected to give favorable results are then discussed in some detail. Considerations are given to cultural methods in orchards, the usual type of farm-orchard development in Massachusetts and in western New York, relative production of apples in southern New England, relation of soil characters to crop and varietal adaptation, the adaptiveness of soils to different varieties of apples, classifica-

tion of soils, miscellaneous notes on soil-varietal adaptation, and the adaptedness of soils to varieties of peaches.

Eliminating unprofitable trees from the apple orchard, S. W. FLETCHER (*Proc. Amer. Pomol. Soc.*, 1913, pp. 138-145).—To show the importance of keeping a yield record for orchard trees the author gives the results secured from a record of an apple orchard kept for a period of four years.

Of a total of 1,245 trees 375 trees averaged 4 bbls. per tree annually and produced 60 per cent of the crop. Two hundred and fifteen trees produced less than 1 bbl. per tree annually each and had been kept at a loss.

Further experiments in the dusting and spraying of apples, D. REDDICK and C. R. CROSBY (*New York Cornell Sta. Bul.* 354 (1915), pp. 53-96, figs. 24).—The work reported in this bulletin is in direct continuation of that previously reported by Blodgett (*E. S. R.*, 30, p. 840).

The experiments were conducted on a commercial scale in three different orchards. Comparisons were made between the dry mixture of sulphur and lead arsenate, lime-sulphur solution, and lead arsenate, and no summer treatment. Details as to quantities of material used, dates of application, and conditions influencing the same, time required, comparative costs, results, and methods of recording data are given in connection with the individual experiments.

Among the important points brought out by the present work the dust method seems to be particularly applicable to large old trees with which the difficulty in doing thorough spraying is most apparent. Although the efficiency of the dust spray in controlling the apple-scab fungus varied in the different orchards, the authors conclude that this is due more to the time of application in connection with prevailing weather conditions than to the lack of efficiency of the mixture. The results obtained in one orchard at least were as favorable in controlling apple scab as those previously reported by Blodgett. Mechanical difficulties in connection with the dusting processes have been sufficiently removed to secure more reliable cost data, and it now appears that an orchard may be protected by dusting as cheaply or even cheaper than by spraying. Insects were not prevalent during the year; hence the tests of the various mixtures on insect control gave no decisive results, except that it appears that the dust mixtures containing 10 per cent of arsenate of lead are as effective as those containing twice the amount. A test of different quantities of dry sulphur per tree indicates that for the present it would be advisable to use a mixture of 90 parts of pure sulphur, especially finely ground, and 10 parts of powdered arsenate of lead, applying on an average 1.5 to 3 lbs. of the mixture per tree at each application.

It was sought to determine whether the adhesive properties of the dry mixture might be improved by the addition of an inert substance. Of the substances used neither gypsum nor wheat flour added to the adhesiveness materially, and the expense of the wheat flour practically precludes its use. Apparently good results were secured in one orchard by mixing hydrated lime with the sulphur. It is suggested, however, that this may have been due to an application of Bordeaux mixture or to applications of dust mixture under very favorable conditions. Prepared sulphur paste suspended in water was compared with lime-sulphur solution; but the test, although not conclusive, indicates that the sulphur paste is not so effective as the lime-sulphur solution.

Among other points brought out by the work, it appears that the amount of secondary infection may be materially reduced by the early destruction of fallen leaves subsequent to the primary infection. Plowing under the old leaves, however, will not be sufficient to make the application of fungicides unnecessary. Observations relative to the factors influencing the adhesiveness

of the dust mixtures indicate that this may be due partially to the fact that the particles of the dust mixture are fine enough to lodge in the dense mat of fine plant hairs covering the leaves and partially to the adhesive nature of some of the lead compounds. Generally speaking, the time of application of dust does not differ from that of applying the spray, except that dusting may be conducted profitably on foggy days subsequent to a heavy early morning rain, whereas spraying could not be done because of wet ground and the drip from the foliage. Under the conditions of the experiments, no inconvenience was experienced from breathing the dust and no unfavorable symptoms of anything like lead poisoning. The eyes should be protected; otherwise no special equipment is necessary.

With reference to the relative importance of dusting and spraying, the authors conclude that in the light of present knowledge the trees must be sprayed in the dormant stage just as in the past. Summer sprayings will doubtless continue in the smaller orchards. Where the orchard is of such an extent that it is practically impossible to keep enough outfits to do the spraying at critical times, the duster will afford necessary relief. In view of the ease with which dust is applied, it appears to be especially applicable to the general farmer with a few trees in the home orchard who rarely ever sprays.

Dusting the apple orchard, D. REDDICK (*Fruit-Grower and Farmer*, 26 (1915), No. 5, pp. 7, 29, figs. 2).—A popular résumé of the experiments made at the Cornell Station in substituting dusting for spraying.

Influence of the axillary shoot on the development and composition of the peach, A. MANARESI and A. DRAGHETTI (*Bul. Uff. Assoc. Ort. Prof. Ital.*, 3 (1915), No. 1, pp. 8-11).—A comparative study was made of peaches provided with axillary shoots and those not accompanied by axillary shoots during their growth.

The data as here presented indicate that those peaches which are provided with axillary shoots are on the average the heavier, and that the difference in weight is greatest when the tree is vigorous and receives plenty of sunlight. The presence of the shoots somewhat retards the maturing of the fruit. The peaches from trees provided with shoots are less firm and apparently more acid and richer in dry matter.

Native American species of *Prunus*, W. F. WIGHT (*U. S. Dept. Agr. Bul.* 179 (1915), pp. 75, pls. 13, figs. 4).—This work contains botanical descriptions of the native American species of *Prunus* and their hybrids. The subject matter is based on a study of nearly all the species in the field, of more than 400 horticultural varieties, and of the collections of this Department and various institutions throughout the country. Introductory considerations deal with the distribution, variation, and adaptability, early history, early botanical descriptions, and horticultural history and development of American plums. A synopsis and key to the species is then given, after which the species are described in detail with reference to their synonymy, literature, characteristics, distribution, and varieties. A bibliography of cited literature is appended.

Pruning stone fruits, O. B. WHIPPLE (*Mo. Bul. Com. Hort. Cal.*, 4 (1915), No. 1, pp. 1-7).—A paper on this subject based on the author's personal observations and experience in pruning apricots, sweet and sour cherries, nectarines, peaches, and plums. The methods of pruning are discussed with special reference to the maintenance of desirable types of fruiting wood.

Ampelographical studies, J. MARQUES DE CARVALHO (*Bol. Dir. Geral Agr. [Portugal]*, 10 (1912), No. 5, pp. 302, figs. 130).—The present work was prepared under the direction of the Portuguese Department of Agriculture and comprises monographs of the varieties of *Vitis vinifera*. A complete botanical descrip-

tion is given of each variety, together with information relative to its time of maturity, productivity, soil adaptation, uses, disease resistance, relative proportion of pulp and must, and chemical composition of the must and wine made from it. The introductory parts contain a historical résumé of viticulture and a classification of the genus *Vitis*. A bibliography of cited literature is included.

Olive culture and production of olive oil in the southern Provinces of Austria, G. SLAUS-KANTSCHIEDER (*Olivicoltura e Produzione d'Olio d'Olive nelle Provincie Meridionali Austriache. Spalato, Austria: Tipografia Sociale Spalatina, 1914, pp. 45*).—A general descriptive account of olive culture in various Provinces of littoral Austria, including statistics of production for the 12 years ended in 1912 and notes on destructive insect pests and fungus diseases of the olive.

The loquat, I. J. CONDRIT (*California Sta. Bul. 250 (1915), pp. 251-284, figs. 11*).—This bulletin treats of the loquat with reference to its botany and nomenclature; geographic distribution; climatic requirements; propagation; soils and situations; orchard management; harvesting, packing, and marketing; varieties, including descriptions of the more promising forms; and insect pests and diseases. The subject matter is based upon field observations as well as upon an extensive search of the literature. A bibliography is appended.

Manurial experiments on cacao, 1913-14, J. DE VERTEUIL (*Bul. Dept. Agr. Trinidad and Tobago, 14 (1915), No. 1, pp. 1-16, pls. 8*).—A progress report on the manurial experiments which are being conducted on a number of private estates (E. S. R., 30, p. 444). The results obtained during the year ended August 31, 1914, are given for each estate, together with comparative data for the two previous years.

Data are also given on the natural-yield plats for the last two years.

The results from these plats continue to indicate that the yield tendencies on any particular plat should be well known before manurial experiments are undertaken.

The composition of the coffee berry and its relation to the manuring of a coffee estate, R. D. ANSTEAD (*Ann. Appl. Biol., 1 (1915), No. 3-4, pp. 299-302*).—In connection with a study of methods of fertilizing coffee in southern India the author found that under well-established mixed shade some four tons of air-dry weight of mulch is accumulated per acre each year, containing 108 lbs. of nitrogen, 223 lbs. of calcium oxid, 36 lbs. of phosphoric anhydrid, and 118 lbs. of potassium oxid. It is concluded that the mulch obtained from shade trees should be taken into account in drawing up a manurial program over a series of years.

During 1912 analyses were made of coffee berries each month from July to December, or from the time they were quite small to the time when they were ripe and ready to pick and pulp. The analyses show that there is a markedly steady increase of potash content throughout the period of growth, from which it is concluded that potash in an available form is needed all the time. The phosphoric acid content appears to be a constant quantity at first with a maximum about October, after which it declines. This suggests that available phosphoric acid is needed chiefly in the beginning of the season. The nitrogen content increases steadily throughout the period of growth and keeps pace with the increase of organic matter. There is a rapid and regular decrease in the amount of moisture in the berries throughout the period of development.

A series of manurial experiments based on these analyses has been planned and is now being carried out.

A new genus, *Fortunella*, comprising four species of kumquat oranges, W. T. SWINGLE (*Jour. Wash. Acad. Sci., 5 (1915), No. 5, pp. 165-176, figs. 5*).—

As a result of a study of the germination, as well as the foliar, flower, and fruit characters of various kumquats, together with the material in the principal herbaria of Europe and America, the author concludes that the kumquat should be placed in a new genus midway between *Atalantia* and *Citrus*. The new genus *Fortunella* together with the four species known at present are here described. The genus is subdivided into the subgenus *Eufortunella* and a new subgenus *Protocitrus*.

Windbreaks, hedges, and ornamentals for irrigated sandy soils of eastern Oregon, R. W. ALLEN (*Oregon Sta. Bul.* 125 (1915), pp. 3-24, figs. 12).—The author discusses in detail the care and development of windbreaks for crop protection as well as the use of shade trees, hedges, and other ornamental plants for farmyards. A limited number of native plants that deserve recommendation for ornamental use are briefly described. The subject matter is based upon the results of experiments with windbreaks and ornamental trees that have been conducted at the Umatilla Station during the past five years. The results of these tests are presented in tabular form.

Flower gardens.—A selected list of books (*New York: N. Y. Pub. Libr.*, 1915, pp. 11).—A selected list of books, prepared by The New York Public Library, dealing with gardens and garden design; special kinds of gardens; individual plants, flowers, shrubs, and trees; gardens of various countries; the pleasures of a garden; children's and school gardens; and miscellaneous garden topics. Books on wild flowers are not included.

The care of house plants (*Missouri Bot. Gard. Bul.*, 3 (1915), No. 2, pp. 25-31).—This paper points out the usual causes of failure in growing house plants, and indicates in a general way the plants and flowers best adapted for the home during the winter months.

Geraniums (*Missouri Bot. Gard. Bul.*, 3 (1915), No. 2, pp. 31-33).—During the summer of 1914 the Missouri Botanical Garden made careful observations on 367 varieties of geraniums with reference to heat and drought resistance; profusion of flowers; color, shape, and size of flower clusters; character of foliage, etc. A list is given of 76 varieties for which favorable growth and satisfactory flower production have been recorded.

FORESTRY.

[Report of] forestry investigations, E. G. CHEYNEY (*Minnesota Sta. Rpt.* 1914, pp. 55-59).—This comprises a brief statement of progress made in various lines of work at the Cloquet Forest Experiment Station, silvicultural studies at Itasca Park, and prairie tree planting investigations at Morris.

Partial data are given in connection with a planting test conducted at the station. It was found that the cost of planting 1,000 trees in a gravelly situation with a wedge spade was \$2 as compared with a cost of \$4 per thousand where the holes were dug with a mattock. Ninety-one per cent of the spade-planted trees were alive in the fall as compared with 80 per cent of those planted with a mattock. In other situations, however, the wedge spade was not so satisfactory.

Among the exotic hardwoods and shrubs being tested several varieties of poplar and willow from China received from the Department of Agriculture are making good growth and give promise of surpassing the native species. Experiments to determine the success of seed trees for restocking cut-over areas show that only in very favorable situations will reproduction be quick and even then the price of the lumber left in the seed trees would go a long way toward paying the cost of planting the land uniformly.

A test of butternut and black walnut seedlings from Minnesota seed which is being made in Itasca Park shows that the butternut can withstand the winter successfully but that the black walnut is severely injured. Experiments in late seedling for the purpose of preventing "damping off" in coniferous stock have shown conclusively that during an average season white and Norway pine sown as late as July 12 have developed into sturdy seedlings capable of resisting the winter. The seedlings showed no trace of "damping off."

In connection with the prairie tree planting investigations the work done so far shows that reliable data with reference to the best species of trees for farm planting, methods of planting, cultivation, etc., can not be obtained from the study of the groves now in existence, their history being too incomplete.

Forest conditions of Mississippi (*Miss. Geol. Survey Bul. 11 (1913), pp. 166, pls. 4, figs. 2*).—This bulletin consists of reprints of Bulletins 5 and 7 of the same series (E. S. R., 23, p. 344; 24, p. 739), together with a statistical supplement by E. N. Lowe containing data on forest products of Mississippi based on the U. S. Census of 1910. A note on the flora of the forest regions of Mississippi by the same author has also been added.

Possibilities of municipal forestry in New York, N. C. BROWN (*N. Y. State Col. Forestry, Syracuse Univ., Ser. XIV, No. 2 (d) (1914), pp. 19, figs. 8*).—The author gives an account of the Syracuse Municipal Forest, calls attention to other similar activities in the State and to successful municipal forests in Europe, and points out the value of municipal forests from the scenic, sanitary, and economic points of view.

The height growth of trees, BERNBECK (*Bot. Jahrb. [Engler], 50 (1914), No. 5, Beiblatt 114, pp. 19-24*).—A brief discussion of the influence of soil, atmosphere, and light on the height growth of trees.

Growth studies in forest trees.—II, *Pinus strobus*, H. P. BROWN (*Bot. Gaz., 59 (1915), No. 3, pp. 197-241, pls. 2, figs. 2*).—In continuation of a growth study of the pitch pine (*P. rigida*), previously noted (E. S. R., 28, p. 49) the results are given of a similar study of the white pine (*P. strobus*).

The important phases discussed include the microscopical characters of the xylem; winter condition of secondary cortex and cambium, awakening of secondary growth, rapidity and intensity of growth, irregularity and termination of secondary growth, and differentiation in the annual rings in aerial parts; primary growth in aerial and underground parts; and secondary growth in underground parts.

A bibliography of cited literature is appended.

Forest fires; their prevention and control, G. LUNDBERG (*Skogsvårdsför. Tidskr., No. 2 (1915), pp. 113-156, figs. 26*).—An account of various types of forest fires and methods of preventing and controlling them.

Forest valuation, H. H. CHAPMAN (*New York: John Wiley & Sons, 1915, pp. XVI+310*).—A text-book and popular guide to that part of the subject of forest finance usually termed "forest valuation." Forest statics, the other part of forest finance, is discussed in a single chapter. The first four chapters of the work are devoted to a summary of economic subjects and tenets, such as values, outlay and income, interest, and valuation of assets. Chapter 5 deals with formulas of compound interest. The succeeding chapters discuss investments and costs in forest production, the valuation of forests, forest statics—the balance sheet—profits, the appraisal of damages, forest taxation, stumpage values, future value of forest products, risks, field appraisals of timber stumpage, and comparison of forest values with agricultural values.

The appendix contains summaries of formulas of compound interest and in forest valuation, definitions of symbols, and tables of compound interest and logarithms.

Forest products of Canada, 1913.—Lumber, lath, and shingles, R. G. LEWIS, W. E. DEXTER, and W. G. H. BOYCE (*Dept. Int. Canada, Forestry Branch Bul. 48 (1915), pp. 55, pl. 1*).—This is the usual report (E. S. R., 30, p. 46) on the quantities, kinds, and values of lumber, lath, and shingles manufactured in the Dominion and in the various Provinces for the calendar year 1913. The total value for the year was \$70,644,362, of which lumber represents \$65,796,438.

Tests of wood preservatives, H. F. WEISS and C. H. TEESDALE (*U. S. Dept. Agr. Bul. 145 (1915), pp. 20, pls. 6, fig. 1*).—This bulletin describes experiments conducted to determine the practical value as wood preservatives of some thirty compounds and chemicals. The experiments were performed by E. Bateman, C. J. Humphrey, Ruth Fleming, and R. E. Prince. The preservatives tested include coal-tar creosotes of various fractions, water-gas-tar creosotes, wood tar and creosote, copperized oil, fuel oil, kerosene, zinc chlorid, zinc sulphate, sodium silicate, sodium fluorid, and other preparations of similar nature listed under trade names.

The methods of conducting the tests are described and the results are presented in a series of tables. The data given show the physical and chemical properties of the preservatives, penetrance of the preservatives and their effect on the strength of wood, permanence of the preservatives after injection into wood, inflammability of treated wood, toxicity of preservatives to *Fomes annosus* and *F. pinicola*, corrosive action of the preservatives, and discoloration of wood treated with preservatives and painted.

The experiment shows in general that highly viscous oils do not readily penetrate, while oils with low viscosities penetrate wood readily. To secure the best results, both the wood and the preservative should be sufficiently heated during the pressure period and the treatments should not be made too rapidly on account of the low thermal conductivity of wood. With water-soluble salts these precautions are not important. Judging from the toxic values secured in this work there is, in practice, being forced into wood about one and one-half times as much zinc chlorid and from ten to twenty times as much coal-tar creosote as is necessary to prevent decay. It is believed that more economic results, especially when decay is accompanied by mechanical deterioration, can be secured by diffusing the preservative more thoroughly through the wood than by saturating the outer fibers and attempting to retain in the wood the more toxic volatile constituents through admixtures of nonvolatile constituents. In the case of zinc chlorid the factor of safety is very low. To secure the best results the injection of from 0.4 to 0.5 lb. per cubic foot now commonly used should be increased.

Wood treated with oils in every case ignited at lower temperatures than untreated wood. Prolonged seasoning of such wood, however, raises considerably its ignition temperature. It seems advisable to season such treated timber before placing it in positions subject to fire. Wood treated with water-soluble salts was in general less difficult to ignite than untreated wood, nevertheless the presence of such preservatives usually renders the wood slow burning and easily extinguishable.

The results of the tests made indicate that woods treated with zinc chlorid, sodium fluorid, and other water-soluble salts might be successfully painted. No definite conclusions can be drawn in regard to this point until the results of tests in cooperation with the National Paint Manufacturers' Association become available.

DISEASES OF PLANTS.

Annual report of the botanical experiment station at Proskau in 1913, R. EWERT (*Ber. K. Lehranst. Obst u. Gartenbau Proskau, 1913, pp. 135-150, figs. 3*).—The author notes that young Fertility pear trees this year, as pre-

vously, set fruit in case of frost-killed pistils as well as of uninjured ones, and a considerable proportion of such fruit was still developing on August 15.

Cronartium ribicola, which is said to attack black currants mainly through the stomata of the lower leaf surface, was largely checked by an application of 1 per cent Bordeaux mixture to that surface (the case of *Fusicladium* on pear giving similar results from the same treatment), but the fruits were unfavorably affected in growth and appearance by this treatment. Red currants were amply protected against *Pseudopeziza ribis* by spraying the upper leaf surface. Comparative tests with California mixture employed against *P. ribis* on currants susceptible thereto resulted favorably.

The influence of air-borne chemical products escaping from factories and settling on vegetation was again studied. See page 826.

A table showing the degrees of attack by fruit disease on pears by *Fusicladium pirinum* and *Mycosphaerella sentina* in relation to the weather for 1904-1913 is also given.

Observations on diseases in nursery and orchard, O. SCHINDLER (*Ber. K. Lehranst. Obst u. Gartenbau Proskau, 1913, pp. 33-38, fig. 1*).—In addition to mention of some insect injuries, brief notes are given of plant diseases.

Spraying for American gooseberry mildew March 17 and April 4 with 0.5 per cent potassium sulphid or 20 per cent lime sulphur, and on May 3 and June 3 with 0.5 per cent potassium sulphid or 2 per cent lime sulphur gave very good results, which were in some degree impaired, however, by a blowing rain about June 3. Repetition of this treatment on June 24 showed no results. A strong (20 per cent) solution of lime sulphur considerably decreased injury to peach foliage from *Eoasacus deformans persicæ*.

Recent studies at the Agricultural Botanical Institute at Munich, L. HILTNER (*Wiener Landw. Ztg., 64 (1914), Nos. 76, pp. 713-715, figs. 3; 77, p. 720, figs. 5*).—It is stated that *Fusarium* attack on rye in early spring was prevented by soaking the seed in 0.1 per cent corrosive sublimate, and that the same treatment seems to promise good results as regards germinability, vigor, and growth in case of legumes. It has been found that lupines showing poor development on limy soil may be restored to normal vigor by spraying several times with 0.5 to 0.75 per cent iron sulphate, but that the chlorosis reappeared after spraying with milk of lime.

A series of experiments indicated that spraying or brushing on 1 to 2 per cent solutions of potassium or magnesium salts in case of several economic plants gives increased growth and vigor.

The effects of fertilizers applied through the medium of the soil are briefly noted. Addition of humus (which acting alone was ineffective) to serradella and mustard which made poor growth in sand with otherwise liberal nutriment gave striking results, and a like effect followed the addition of certain pulverized rocks to mineral nutritive media.

Second contribution to the mycological flora of Tunis, R. MAIRE (*Bul. Soc. Hist. Nat. Afrique Nord, No. 9 (1914), pp. 254-260, figs. 3*).—About 40 species are listed, of which 2 are described as new, these being named, respectively, *Protomyces helminthia* on *Helminthia echinoides*, and *Lophidium chamæropis* on *Chamærops humilis*.

New species of *Colletotrichum* and *Phoma*, P. J. O'GARA (*Mycologia, 7 (1915), No. 1, pp. 38-41*).—The author describes and names as new species *C. destructivum* parasitic on the leaves, petioles, and stems of clover, *C. solanicolum* in the subterranean stems of potato, and *C. salmonicolor* and *P. rostrata* on the leaves and stems of *Asclepias speciosa*, all in Salt Lake Valley, Utah.

The control of root knot, E. A. BESSEY and L. P. BYARS (*U. S. Dept. Agr., Farmers' Bul. 648 (1915), pp. 19, figs. 20*).—This is a popular bulletin in which

descriptions are given of the root knot of various plants due to *Heterodera radiculicola* and suggestions for its control.

The means of control consist principally in the growth of resistant plants, lists of which are given. In orchards and ornamental gardens no very satisfactory methods of control have been determined. In greenhouses and seed beds steam fumigation is recommended, and for field purposes rotation of crops is the most practical method known.

The conidial form of *Ophiobolus herpotrichus*, E. VOGES (*Centbl. Bakt. [etc.]*, 2. Abt., 42 (1914), No. 1-4, pp. 49-64, figs. 9).—The author, referring to work previously noted (E. S. R., 29, p. 244; 31, p. 542), now states that an *Acremonium* (*A. alternatum*), and not a *Fusarium*, is found to be the conidial form of *O. herpotrichus*. Among the forms present in the fungal complex characterizing stalk disease of cereals, *F. rubiginosum*, *Hendersonia herpotricha*, *Mucor racemosus*, *Leptosphaeria tritici*, *Cladosporium herbarum*, *Alternaria tenuis*, *Ascochyta* sp., and *Septoria* sp. have been identified.

Control of stem rust of rye, H. C. MÜLLER and E. MOLZ (*Landw. Wchnschr. Sachsen*, 16 (1914), No. 7, pp. 60, 61; *abs. in Ztschr. Landw. Versuchsw. Österr.*, 17 (1914), No. 6-7, pp. 647, 648).—Experimentation showed that *Urocystis occulta* on rye is easily controlled by steeping the seed in 0.5 per cent copper sulphate for 16 hours, in 0.25 per cent commercial formaldehyde for 15 minutes, or in water at 20° C. for 15 hours or at 30° C. for 4 to 6 hours. The two last-named treatments were followed respectively by steeping in water at 50° C. for 10 minutes or at 52° C. for 5 to 10 minutes without very serious impairment of germinability.

Leaf spot of beans, O. APPEL (*Mitt. Deut. Landw. Gesell.*, 29 (1914), No. 18, pp. 249-251, figs. 3; *abs. in Ztschr. Landw. Versuchsw. Österr.*, 17 (1914), No. 6-7, p. 648).—An unusually threatening recent increase of infection of beans by *Glæosporium* (*Colletotrichum*) *lindemuthianum* is noted. The remedies available are careful seed selection, destruction of all infected plants, employment of open ground for planting, and spraying with 0.5 per cent Bordeaux mixture once or twice before the blooms open.

Eggplant rots, F. A. WOLF (*Mycol. Centbl.*, 4 (1914), No. 6, pp. 278-287, figs. 4).—A detailed account of a study already noted (E. S. R., 31, p. 344).

Further studies on the spread and control of hop mildew, F. M. BLODGETT (*New York State Sta. Bul.* 395 (1915), pp. 29-80, pls. 2, figs. 2; *abs. in Phytopathology*, 4 (1914), No. 6, pp. 400, 401).—In continuation of studies of the hop mildew (E. S. R., 29, p. 346) the author gives the results of three years' experiments on control, together with further observations on the life history of the fungus, relation of the weather to the spread of the epidemic, etc.

The perithecia or winter fruit bodies of the fungus have been found to reach maturity in March and have been shown capable of causing infection in the greenhouse at that time of the year. Artificial inoculations in the field indicated that the period of incubation is about ten days.

In the experiments on the control of the disease, flowers of sulphur, heavy flour sulphur, and fine flour sulphur have been compared, and also the effect of lime used in conjunction with sulphur. Flowers of sulphur have been found variable in mechanical condition, and it was impossible to apply satisfactorily some forms. It was also determined that injury following the use of this form of sulphur was due to the presence of considerable amounts of sulphuric acid. Extremely fine flour sulphur also proved difficult to apply, and flour sulphur of a medium degree of fineness seemed to be most efficient, easiest to handle, and the cheapest of the fungicides tested. Sulphur and lime mixture proved less effective than sulphur alone.

Stem rot of sweet potato, L. L. HARTER and ETHEL C. FIELD (*Ztschr. Pflanzenkrankh.*, 24 (1914), No. 4, pp. 204-207).—This is a brief account of investigations which have already been noted elsewhere (E. S. R., 32, p. 50).

Black rot, shed burn, and stem rot of tobacco, J. JOHNSON (*Wisconsin Sta. Research Bul.* 32 (1914), pp. 63-86, figs. 7).—The results are given of studies on some warehouse and curing house troubles of tobacco.

The black rot, due to *Sterigmatocystis nigra*, is said to cause considerable loss in the process of fermentation under certain conditions. The fungus requires in its development a moisture content of 26 per cent or more, a temperature of from 30 to 44° C. (86 to 111.2° F.), together with proper aeration.

In order to control this disease regulation of warehouse conditions so as to keep down the moisture content and provide proper temperature is recommended. Fumigation with formaldehyde may also be adopted where the disease has previously been very prevalent.

The author states that the difference between shed burn and stem rot, which are due to one or more fungi, among them a species of *Fusarium*, appears to be one of location rather than a difference in causal organisms. If the midrib is attacked, the resulting decay is called stem rot, while if the leaf tissue is decayed it is called shed burn.

These diseases may be controlled by regulation of temperature and humidity in the curing shed in connection with proper ventilation.

The yellow blight of the tomato, D. C. GEORGE (*Washington Sta. Popular Bul.* 82 (1915), pp. 4).—This is a popular bulletin based largely upon a previous publication of the station (E. S. R., 32, p. 444).

Fire blight, I. D. CARDIFF (*Washington Sta. Popular Bul.* 80 (1915), poster).—This publication is intended to call attention to the prevalence of the fire blight of pears, apples, etc., and gives brief suggestions for control.

Life history of a new species of Sphærella, B. B. HIGGINS (*Mycol. Centbl.*, 4 (1914), No. 4, pp. 187-193, figs. 2).—A fungus, said to be new and to cause a disease of *Prunus pennsylvanica*, is described under the name *Mycosphærella nigerristigma*. The name *S. nigerristigma* is, however, preferred.

Roncet of grape, J. BERNATSKY (*Ztschr. Pflanzenkrankh.*, 24 (1914), No. 3, pp. 129-139, figs. 2).—The author, discussing this phenomenon and allied abnormalities describes the internal appearance of the deformed regions in cases studied, and suggests possible causes, which it is said may differ considerably as to character and mode of action.

[Two fungus parasites of conifers in Scotland], W. SOMERVILLE (*Quart. Jour. Forestry*, 9 (1915), No. 1, pp. 68, 69, pl. 1).—*Chrysomyxa abietis* and *C. rhododendri* are said to have been noted one or more times previously on conifers at points in Scotland, and a watch for these fungi is recommended.

Withertip of fir in Sweden, T. LAGERBERG (*Meddel. Stat. Skogsförsöksanst. (Mitt. Forstl. Vers. Anst. Schwedens)*, No. 10 (1913), pp. 9-44, I-IV, figs. 19).—This is substantially the same as a report already noted from another source (E. S. R., 30, p. 453).

On the mode of infection of larch canker and the possible means of preventing it, W. E. HILEY (*Quart. Jour. Forestry*, 9 (1915), No. 1, pp. 7-17, pls. 3).—Among the ways in which *Dasyscypha (Peziza) calycina* may infect larch are mentioned wounds made by frost, hail, the larch aphid (*Chermes abietis*), or abrasions due to movements of men, animals, or air, though the dangers from such sources has, it is thought, been overestimated.

Owing to the death of young branches the cankers of most direct importance to foresters are those induced after the first two or three years of growth.

Examinations of anatomical and physiological data are not decisive as to whether the mycelium passes from a dead branch to the main axis through the wood or just outside it. Death of dormant buds is considered as a possible means of infection of the stems, but probably this is of no great importance. It is held that the most important source of infection are the dead limbs left on the stems, this suggesting removal of affected branches before they are dead, preferably during dry months when spores of this fungus are not being given off.

A disease of pine shoots (*Quart. Jour. Forestry*, 9 (1915), No. 1, pp. 64, 65).—A fungus, said to be more common on the Corsican pine than on Scotch pine and some other conifers, has been identified as *Cenangium abietis*. Infection occurs in late autumn or winter. The leaves begin to fall rapidly in early summer, the shoots of the previous year's growth often being completely defoliated. The bud of an infected shoot rarely expands at all. Both ascospores and one to three celled conidia in large quantities are said to be produced by the fungus.

A leaf cast of pines in Sweden, T. LAGERBERG (*Meddel. Stat. Skogsförsöksanst. (Mitt. Forstl. Vers. Anst. Schwedens)*, No. 10 (1913), pp. 139–180, XVII–XXII, figs. 8).—A leaf disease of pines is described in its several stages and as to its effects on the foliage and trees. It is said to show pycnidia corresponding to those borne by *Leptostroma pinastri*, the conidial stage (*Lophodermium pinastri*) being already known. A bibliography is given.

A disease of oaks in Westphalia, HEY (*Ztschr. Forst u. Jagdw.*, 46 (1914), No. 10, pp. 595–598).—The author cites facts recently observed by himself which are held to indicate that *Armillaria mellea* is the cause of the dying out of oak trees and also of beech in one case noted.

A timber rot accompanying *Hymenochaete rubiginosa*, H. P. BROWN (*Mycologia*, 7 (1915), No. 1, pp. 1–20, pls. 3).—The author describes the results of invasion by *H. rubiginosa* and its saprophytic activity in case of decorticated chestnut (also, but more rarely, of oak) near Ithaca, N. Y., and also the development and habits of this fungus.

The fruit bodies are annual and xerophytic, spores being shed intermittently during moist periods for several months. A superficial peripheral type of decay usually accompanies the typical decay due to this fungus.

Studies in dry rot, V, C. WEHMER (*Mycol. Centbl.*, 4 (1914), Nos. 5, pp. 241–252, fig. 1; 6, pp. 287–299, pls. 2).—In continuance of previous reports (E. S. R., 31, p. 248) the author gives detailed results of studies on conditions as favorable or unfavorable to development on structural woods, etc., by *Merulius*, including the influence of previous sterilization, of impregnation with nutritive substances, and of lowering the temperature during the tests.

Air-dry or dampened, but not strictly sterile, fir wood was not severely attacked by detached mycelium of *Merulius*, even in a moist chamber, the experiments indicating a high degree of sensitiveness of this fungus to conditions as regards both nutritive materials and the presence of other organisms (bacteria, yeasts, and other fungi). Other experiments with strictly sterile moist heartwood or sapwood gave a growth the luxuriance of which was in close relation with the degree of moisture present in the materials attacked (moisture of the air showing little if any influence). Spore development was not obtained on either air-dry or dampened wood. Attached mycelium, however, proved much less sensitive to conditions hindering growth in detached portions.

The liability to extension by *Merulius* appears, therefore, to be in practice somewhat limited by the tendencies above noted.

ECONOMIC ZOOLOGY—ENTOMOLOGY.

Handbook of medical entomology, W. A. RILEY and O. A. JOHANNSEN (*Ithaca, N. Y.: The Comstock Publishing Co., 1915, pp. IX+348, pl. 1, figs. 174*).—The object of this work, as stated by the authors, "is to afford a general survey of the field, and primarily to put the student of medicine and entomology in touch with the discoveries and theories which underlie some of the most important modern work in preventive medicine."

In an introduction the authors discuss early suggestions regarding the transmission of disease by insects and the ways in which arthropods may affect the health of man. The subject is then taken up under the headings of arthropods which are directly poisonous; parasitic arthropods affecting man; accidental or facultative parasites; arthropods as simple carriers of disease germs, as direct inoculators of disease germs, as essential hosts of pathogenic organisms, and as essential hosts of pathogenic protozoa; some possible but imperfectly known cases of arthropod transmission of disease, and keys to the arthropods noxious to man. In an appendix the use of hydrocyanic acid gas against household insects with the details relating to household fumigation and lesions produced by the bite of the black fly are dealt with.

A 14-page bibliography and a complete subject index are included.

Entomology, or the study of insects, and its importance, E. S. TUCKER (*Louisiana Stas. Crop Pest Notice 3 (1915), pp. 3-8*).—This is a popular introduction to the subject. The author points out the importance of a knowledge of insects in order that the detrimental and beneficial ones may be distinguished and that control measures may be intelligently applied.

Habits and instincts of insects up to the growth of the social instincts, O. M. REUTER (*Lebensgewohnheiten und Instinkte der Insekten bis zum Erwachen der sozialen Instinkte. Berlin: R. Friedländer and Sohn, 1913, pp. XVI+448, figs. 84*).—This work is separated into 26 chapters in which the author deals at length with the bionomics of insects.

Cyanid of potassium in trees (*Agr. News [Barbados], 14 (1915), No. 332, p. 26*).—The accounts previously noted (*E. S. R., 32, pp. 152, 754*) having come to attention several tests were made by the Imperial Department of Agriculture to determine what effect cyanid has on certain plants. Three trees were used, namely, a small mulberry (*Morus alba*), king of flowers (*Lagerstræmia indica*), and a red gum (*Bursera gummifera*), the cyanid being applied in a hole $\frac{3}{8}$ in. in diameter, bored into the trees to a depth of about $1\frac{1}{2}$ to $1\frac{3}{4}$ in. The holes were then filled with finely crushed cyanid of potassium and plugged with paraffin wax on October 21, 1914.

In each case the trunk of the tree was considerably injured and the method is considered liable to result in serious injury to the plants.

[Report of] department of entomology (*Oregon Sta. Rpt. 1913-1914, pp. 13-17*).—The common eastern lady beetle (*Megilla maculata*) has been introduced from the East and is being reared in confinement.

The results of insecticide investigations have been summarized in part as follows: "Lime-sulphur plus arsenite of zinc, lime-sulphur plus arsenate of lead (acid), and lime-sulphur plus arsenate of lead (nonacid), in all strengths caused serious burning. If anything, the nonacid injury was slightly the worst. Lime-sulphur caused considerable injury, but not one-half as much as in the combination sprays. Arsenite of zinc alone and in all strengths caused considerable burning. The burning was different, however, from that of the combination and lime-sulphur sprayed trees. With the combination sprays the entire leaf was destroyed or else the injury covered a distinct portion, all parts of which were discolored. Scab spots on the leaves appeared black, ordinary

leaf tissue brown. . . . Arsenate of lead (acid) and arsenate of lead (non-acid) did not cause injury in any case when used alone. In experiments with arsenite of zinc, etc., where injury did occur, the injury did not begin to show up badly for about 5 days, when suddenly, overnight, it appeared at its worst. The check trees, sprayed with water, did not show injury. . . .

"Arsenite of zinc is a quicker-acting poison than arsenate of lead, acid or nonacid, and remains in suspension much better. Acid arsenate of lead is a quicker-acting poison than the nonacid and remains in suspension better. Non-acid arsenate of lead is slow in its action, but is satisfactory in that death finally occurs. Lime-sulphur in the experiments conducted has not proved to have much value as a stomach poison. Lime-sulphur with arsenicals seems to retard to a more or less extent the action of the poison, and it is possible for larvæ to feed on foliage sprayed with weak strengths of lime-sulphur plus arsenate of lead and recover, if transferred to fresh foliage within a few days. . . . Lime-sulphur probably acts as a repellent to biting insects in the same way that Bordeaux does against the potato flea-beetles."

The larvæ of tent caterpillars (*Malacosoma erosa* and *M. pluvialis*) were used in the experiments.

Report on injurious insects in Finland, 1911 and 1912, E. REUTER (*Landtbr. Styr. Meddel. [Finland], Nos. 87 (1914), pp. 18; 93 (1914), pp. 14*).—These annual reports of the entomologist of Finland discuss the occurrence of the more important insect enemies of crops during the years 1911 and 1912.

Report of the imperial pathological entomologist, F. M. HOWLETT (*Rpt. Agr. Research Inst. and Col. Pusa, 1912-13, pp. 78-83*).—A brief report of the work of the year with ecto-parasites, fruit flies, etc.

[Annual report of the government entomologist of Uganda], C. C. GOWDEY (*Ann. Rpt. Dept. Agr. Uganda, 1914, pp. 36-58*).—The author here reports on the more important insect enemies of the principal crops of Uganda, particularly of coffee and cotton. The yellow-headed coffee borer (*Dirphya [Nitocris] princeps*) and the coffee-berry borer (*Stephanoderus coffeæ*) which attack coffee, and the spiny bollworm (*Earias insulana*), *Oxycarenus hyalinipennis*, and the leaf-footed plant bug (*Leptoglossus membranaceus*), which attack cotton, are given particular consideration.

Proceedings of the German Association of Economic Entomology, edited by K. ESCHERICH and F. SCHWANGART (*Ztschr. Angew. Ent., 1 (1914), No. 1, pp. 240, pls. 3, figs. 61*).—The papers presented at the first annual meeting, held at Würzburg, October 21 to 24, 1913, include the following: The Aims and Problems of the German Society of Economic Entomology, by K. Escherich (pp. 14-19); The Fight Against the Grapevine Phylloxera in Prussia, by E. H. Rübsaamen (pp. 20-49); The Vine Phylloxera in Franconia, by Orth (pp. 50-58); Experimental Demonstration of a Biological Race Difference in the Phylloxera from Lorraine and from Southern France, *Peritymbia (Phylloxera) vitifolii pervasiatrix*, by C. Börner (pp. 59-67); Economic Entomology in Italy, by R. Heymons (pp. 68-83); Economic Entomology in Germany, by L. Reh (pp. 84-94); Economic Entomology in the German Colonies, by G. Aulmann (pp. 95-136); The Royal Institution for Bee Keeping, Investigations at Erlangen, by E. Zander (pp. 137-146); The Biology of the Tsetse Flies, by E. Teichmann (pp. 147-159); A New Grain Pest in Hungary (Halmeule: *Tapinostola musculosa*), by J. Jablonowski (pp. 160-171); The Habits of Dipterous Parasites of Caterpillars (Raupenfliegen), by H. Prell (pp. 172-195); The Mulberry or West Indian Peach Scale and Its Control by Parasites, by J. Bolle (pp. 196-213); Economic Entomology and Bird Protection, by K. Haenel (pp. 214-222); and The African Silkworms and Their Agricultural Importance, by A. Schultze (pp. 223-231). A list of the members is appended.

Insect enemies of the beet root in the south of France, F. PICARD (*Vie Agr. et Rurale*, 3 (1914), No. 14, pp. 390, 391).—A brief discussion of the more important beet pests.

Insect enemies of locusts and of noxious acridians in Russia.—I, Coleopterous enemies, I. A. PORTCHINSKY (*Trudy Būro Ent.* [St. Petersburg], 11 (1914), No. 1, pp. 68, pls. 2, figs. 22; abs. in *Rev. Appl. Ent.*, 2 (1914), Ser. A, No. 7, pp. 473-475).—In this paper the author deals at length with the beetles which destroy the eggs of Orthoptera, 16 belonging to the genus *Mylabris* and 3 to the genus *Epicauta*.

The pea thrips, GAUMONT and VUILLET (*Bul. Soc. Nat. Agr. France*, 74 (1914), No. 2, pp. 168-173).—This article relates to *Frankliniella robusta* (*Thrips pisivora*) which is a source of considerable injury to peas in France.

In 1913 this thrips was abundant on peas, beans, and sweet peas in the Aisne. It is said to occur in abundance in the blossoms of trefoil at Bourg-la-Reine, Department of Seine, in May, and individuals have been found in the blooms of crown vetch and lucern at Beaune, *Ajuga reptans* at Chaumont-en-Vexin, and *Ecballium elaterium* at Marseille. Thus it appears that this thrips is very widely distributed in France and that it can survive at least temporarily on other plants than peas and beans.

Maine aphids of the rose family, EDITH M. PATCH (*Maine Sta. Bul.* 233 (1914), pp. 253-280, pls. 3, figs. 6).—This paper gives brief descriptive accounts and drawings of those aphids found in Maine upon members of the rose family (Rosaceæ). The most serious of the apple aphids has been previously noted (E. S. R., 30, p. 548), but the plum aphids have not previously been worked up.

The species considered are the woolly aphid of hawthorn leaf, *Prociphilus corrugatus* on Juneberry (*Amelanchier*) and *Cratægus*; *Schizoneura lanigera*, *Macrosiphum cratægi*, *Aphis avenæ*, *A. brevis*, and *A. bakeri* on *Cratægus*; *Myzus porosus* on strawberry; *Myzus cerasi*, *A. furcata* n. sp., *Myzus persicæ*, *A. cerasifoliæ*, and *A. tuberculata* n. sp. on cherry; *A. cerasifoliæ*, *A. prunorum*, *A. cardui*, *Phorodon humuli*, and *Hyalopterus arundinis* on plum; *S. lanigera* on mountain ash; *S. lanigera*, *A. avenæ*, *A. pomi*, *A. sorbi*, and *M. persicæ* on apple; *A. brevis* on *Pyrus japonica*; *Macrosiphum rosæ*, *M. solanifolii*, *M. dirhodum*, and *Myzus rosarum* on roses; *A. rubiphila* n. sp., and *Macrosiphum rubicola* on raspberry; and *A. spiræcola* n. n., *A. spiræphila* n. sp., and *Macrosiphum spiræcola* n. sp., on *Spiræa*.

Brief notes on aphid control and a list of the literature cited are included.

The woolly apple aphid, A. C. BAKER (*U. S. Dept. Agr. Rpt.* 101 (1915), pp. 55, pls. 15, figs. 3).—This is a report of studies of *Eriosoma* (*Schizoneura*) *lanigera* commenced in the spring of 1912.

In experiments conducted it was found that the species does not migrate to *Ribes* as is the case with *E. ulmi* in Europe. The results of the author's experiments did not agree with those of Dr. Patch (E. S. R., 23, p. 251), who reports transferring from elm to apple the species which she considered as *E. americana*, in that the species which he considered *americana* would not feed upon apple; they did agree, however, in that the elm was proved to be the winter host of *E. lanigera*, so that he credits her with having first discovered that the woolly aphid migrates from the elm to the apple in the spring and in the fall returns to the elm. The negative results obtained from experiments with *Ribes* indicate that three species develop on elms, namely, *E. ulmi*, *americana*, and *lanigera*.

The subject is taken up under the headings of early history; name, including synonymy; methods of study; forms of the species, including technical descriptions; and a detailed study of the structure, habits, etc., of the species, including molts, digestive system, injuries, body fluids, muscles, movement,

migrations, reproduction, wax secretion, respiration, and nervous system. Under reproduction the author treats of the reproductive system, parturition, number of young, and courtship.

The life history of this species is summarized as follows: "The egg is laid, as a rule, upon the bark of elm in crevices, though occasionally it is laid upon other trees. In the spring, toward the first of April, it hatches, and the young stem mother so produced migrates to the base of a bud. Here she may remain for some days before the bud opens. Upon opening, the leaves curl or 'rosette' about the insect, and in this house she produces her young. This second generation is wingless and lives within the curled leaves or upon the tender twigs. The generation matures late in April or in early May. It in turn produces a third generation, which is present upon the elm leaves from about May 1 until early June. An insect of this third generation is winged and is known as the spring migrant. It flies from the elm leaves to apple or related plants, settling upon the leaves, twigs, and water sprouts. Here it produces the fourth generation, which is wingless and which is the first generation on apple of the well-known woolly aphid. About July 1 this generation is mature and is giving birth to another generation, the fifth, which is exactly like it. Many individuals of this fifth generation migrate to the roots, but others remain upon the twigs. Those which remain above ground produce a generation of winged forms, the sixth generation, which is mature about the middle of September. These fall migrants may be found upon the trees until late autumn, but they nearly all migrate to the elms. Here they settle upon the bark and produce the sexual forms, males and females, small wingless, beakless individuals. These mate, and the female, known as the oviparous female, then deposits her solitary egg in a crevice of the bark, where it passes the winter to hatch as a stem mother the following spring."

A list of the literature referred to in the text is appended.

The host plants and habits of *Aphis rumicis*, with some observations on the migration of, and infestation of, plants by aphides, J. DAVIDSON (*Ann. Appl. Biol.*, 1 (1914), No. 2, pp. 118-141, fig. 1).—The author reports upon investigations of the habits of aphidids, made during the year, which failed to furnish sufficient data upon which to base any definite conclusions, although many of the observations have suggested certain lines of inquiry. In the latter part of the paper he briefly discusses some of the factors which may underlie the questions of the migration of aphidids and the infestation of plants by them.

Preliminary notes on damage to apples by capsid bugs, J. C. F. FRYER (*Ann. Appl. Biol.*, 1 (1914), No. 2, pp. 107-112, pls. 2).—This is a brief review of the literature on the subject and a report of observations made in English orchards. The distribution of the capsid attack in England is very local and is not known to be widespread in any district; at present it is known to occur sporadically in Kent, Suffolk, Nottingham, Worcester, and Hereford. The injured fruit is said to be almost unsalable and orchards were visited where from 30 to 50 per cent of the crop was affected, no account being taken in this estimate of fruit so damaged that it fell off before reaching maturity. Investigations of *Lygus pratensis*, *Psallus ambiguus*, *Atractotomus mali*, *Plesiocoris rugicollis*, and *Orthotylus marginalis* show that either of the two last named, or both, are responsible for the injury.

An experiment was conducted by an orchardist which consisted in excluding the larvæ of these two species from a number of trusses and in inclosing them with others. The results show that the trusses from which the two species were excluded developed sound fruit, while the apples inclosed with them sustained typical capsid damage.

"The only treatment that can be suggested is a spray of soft soap and nicotine, or possibly soft soap and quassia, but success will depend on a nice estimation of the exact time to apply the wash, and the thoroughness with which the application is made."

The life history and habits of the pear thrips in California, S. W. FOSTER and P. R. JONES (*U. S. Dept. Agr. Bul. 173* (1915), pp. 52, pls. 5, figs. 14).—This is a detailed account of (*Euthrips*) *Teniothrips pyri*, based in part on studies previously noted (E. S. R., 24, p. 455). The subject is dealt with under the headings of the history, economic importance, character of injury, description, systematic position, anatomy, life history and habits, and natural enemies.

The San José scale and its control, A. L. QUAINANCE (*U. S. Dept. Agr., Farmers' Bul. 650* (1915), pp. 27, figs. 17).—This is a revision of Circular 124 of the Bureau of Entomology, previously noted (E. S. R., 23, p. 661).

The San José scale insect (*Aspidiotus perniciosus*), A. L. MELANDER (*Washington Sta. Popular Bul. 78* (1915), pp. 7, figs. 3).—A popular account.

Monograph of the bombycine moths of North America, including their transformations and origin of the larval markings and armature, II and III, A. S. PACKARD (*Mem. Nat. Acad. Sci.*, 9 (1905), pp. 272, pls. 61, figs. 19; 12 (1914), pt. 1, pp. IX+516, pls. 113, figs. 34).—Part 2 of this work (E. S. R., 8, p. 147) deals with the subfamily Ceratocampinae. Before taking up the classification and life histories of the subfamily, which form the major part of the work, the author discusses such phases as coloration and protective attitudes of the Notodontidae, the larval armature of the Ceratocampinae, the caudal horn of the Ceratocampidae, protective armature both in shape and color and defensive movements, coloration in the larvae, dichromatism or color variation in the larva, the life history of *Ceratonia myntor*, phylogeny of this subfamily, phylogeny of the Sphingidae, origin of the Syssphingina and also the Symbombycina from the Notodontidae, geographical distribution of the subfamily, etc. Twenty-three plates in color illustrate the larval and adult stages of the species.

The third part of the work deals with the families Ceratocampidae (exclusive of the Ceratocampinae), Saturniidae (including hybrids), Hemileucidae, and Brahmæidae. A list of parasites of the species of these families is included. This third part, largely in manuscript form at the time of the author's death, has been edited by T. D. A. Cockerell. Thirty-four colored plates illustrate the larval stages of the species considered.

A new phycitid injurious to pine, H. G. DYAR (*Insecutor Inscitiæ Menstruus*, 2 (1914), No. 7, p. 112).—*Pinipestis erythropasa*, reared from cones of *Pinus chihuahuana* in the Chiricahua National Forest, Arizona, is described as new to science.

The caterpillars attacking the oaks of Richmond Park, with an account of an experimental spraying with lead chromate, R. H. DEAKIN (*Ann. Appl. Biol.*, 1 (1914), No. 1, pp. 77-84, pls. 6).—This paper gives a detailed account of the work previously noted from another source (E. S. R., 31, p. 60).

The two commonest caterpillars were a leaf roller, *Tortrix viridana*, and the winter moth (*Cheimatobia brumata*). The spray used was made from a paste of the following composition: Lead chromate 50 per cent, soft soap 25 per cent, gelatin 1.5 per cent, and water 23.5 per cent. One lb. of the paste was used to about 30 gal. of water, thus giving 1 lb. of lead chromate to every 60 gal. of spray. Caterpillars fed on sprayed foliage either died at once or became starved and finally perished, so that no doubt remains as to the efficacy of the poison.

Control of the gipsy moth, W. C. O'KANE (*N. H. Dept. Agr., State Moth Work Circ. 5* (1915), pp. 4).—A popular account.

On the causes and symptoms of flacherie and polyhedral disease of caterpillars, E. FISCHER (*Biol. Centbl.*, 34 (1914), Nos. 5, pp. 308-328; 6, pp. 357-371; *abs. in Rev. Appl. Ent.*, 2 (1914), Ser. A, No. 8, p. 528).—The author has made investigations of the cause and symptoms of flacherie with caterpillars of three species of the genus *Vanessa* and with *Pyrameis cardui*, comparing his results with those obtained by Verson (*E. S. R.*, 19, p. 256) with the silkworm in Italy. Flacherie and polyhedral disease are considered to be distinct on the basis of the form of the polyhedral bodies. The symptoms of both are discussed.

Biological notes on the larva of *Tipula oleracea* and its ravages in the vicinity of Avesnois in the spring of 1914, P. DÉSOIL (*Compt. Rend. Soc. Biol. [Paris]*, 77 (1914), No. 21, pp. 126, 127; *abs. in Rev. Appl. Ent.*, 2 (1914), Ser. A, No. 10, pp. 606, 607).—This dipteran attacks chiefly grasses and clovers. Its injury commences toward the end of winter and the spring growth limits its spread, the larvæ being active from October to May. The only practical measure of control consists in deeply plowing under the infested turf and in sowing in the months of March and April.

Ceratopogoninae sucking the blood of other insects, F. KNAB (*Proc. Ent. Soc. Wash.*, 16 (1914), No. 3, pp. 139-141).—This article supplements that previously noted (*E. S. R.*, 31, p. 455).

A new tachinid parasite of *Diapheromera femorata*, W. R. WALTON (*Proc. Ent. Soc. Wash.*, 16 (1914), No. 3, pp. 129-132, figs. 6).—It is stated that two tachinids have previously been known to be parasitic upon Phasmidae. A third parasite reared at Milwaukee, Wis., from the common walking stick (*D. femorata*) is described as *Euhallidaya severinii* n. g. and n. sp.

Lucilia sericata attacking a live calf, H. F. HUDSON (*Canad. Ent.*, 46 (1914), No. 12, pp. 416).—The author records observations at Strathroy, Ontario, in which a Holstein calf from 5 to 6 weeks old was attacked by the larva of *L. sericata*. The maggots were most abundant around the anus and base of the tail, where some had eaten into the flesh to a depth of about a quarter of an inch.

Descriptions of two new species of Strepsiptera parasitic on sugar cane insects, W. D. PIERCE (*Proc. Ent. Soc. Wash.*, 16 (1914), No. 3, pp. 126-129).—*Stenocranophilus quadratus*, a parasite of the destructive *Stenocranus saccharivorus* at Rio Piedras, P. R., and *Pyrilloxenos compactus*, a parasite of the sugar cane fly of India, *Pyrilla* sp., at Pusa, India, represent new genera and species.

Turnip flea-beetles.—Effect of turpentine and paraffin on the germination of turnip seed, G. H. CORBETT (*Ann. Sci. Bul. Roy. Agr. Col. Cirencester*, No. 4-5 (1914), pp. 84-88).—Experiments in which turnip seed was soaked from one to twenty days in turpentine or paraffin indicate that these substances do not retard germination when put under soil conditions but appear to hasten it.

Alfalfa attacked by the clover-root curculio, F. M. WEBSTER (*U. S. Dept. Agr., Farmers' Bul.* 649 (1915), pp. 8, figs. 6).—This is a summarized account of *Sitones hispidulus*, an investigation of which reported by Wildermuth has been previously noted (*E. S. R.*, 22, p. 758).

Its feeding habits so far as determined are almost exactly the same upon alfalfa as upon clover. Its attack on alfalfa, which has largely come to attention since the paper above mentioned was prepared, has occurred throughout all parts of Baltimore County, Md., at West Chester, Pa., about Salt Lake City, Utah, etc. Investigations of remedial and preventive measures have not as yet been carried out. Since the larvæ do not as a rule descend much more than 1 in. below the surface it is thought that disking or harrowing the fields as soon as the first hay crop is removed will break up the pupal cells and vast numbers of this pest be thus destroyed.

The cotton-boll weevil in Cuba, G. N. WOLCOTT (*Proc. Ent. Soc. Wash.*, 16 (1914), No. 3, pp. 120-122).—Observations made in Cuba during the winter of 1911-12 and again during January and February, 1914, show that but little injury was done by the boll weevil. No boll weevils were found on cotton at Kingston, Jamaica, in March, 1914.

A braconid parasite on the pine weevil, *Hylobius abietis*, J. W. MUNRO (*Ann. Appl. Biol.*, 1 (1914), No. 2, pp. 170-176, figs. 4).—A report of observations made on pine weevils and parasites collected in a plantation near Aberdeen.

This weevil is a source of injury in the adult stage only, doing considerable damage by gnawing the tender bark of young conifers and thus causing them to wilt and die. In the absence of conifers, it will readily attack birch, mountain ash, and oak. The author's observations indicate that *Bracon hylobii* may prove of considerable value in combating the weevil, which every year is becoming more and more common in newly formed plantations, especially in Scotland.

A revision of the North American species of the braconid genus *Habrobracon*, R. A. CUSHMAN (*Proc. Ent. Soc. Wash.*, 16 (1914), No. 3, pp. 99-108).—Seven species are recognized of which *Habrobracon variabilis*, reared from *Canarsia hammondi*, at Siloam Springs, Ark., and *H. platynotæ* from *Platynota* sp., at Hollywood, Cal., are described as new to science.

Descriptions of new chalcid flies, A. A. GIRAULT (*Proc. Ent. Soc. Wash.*, 16 (1914), No. 3, pp. 109-119).—Among the parasites here described as new is *Anaphoidea luna*, a species obtained in shipments of the alfalfa weevil (*Phytomus posticus*) from Italy.

Some notes on *Xyleborus fornicatus* (shot-hole borer), A. RUTHERFORD (*Trop. Agr. [Ceylon]*, 42 (1914), Nos. 2, pp. 132-139; 3, pp. 220-222).—The burying of prunings from tea plants is said to have been the prevailing method applied in the control of *X. fornicatus*. Upon looking into the subject the author was able to find but a single experiment relating to their destruction in this way and was led to conduct the several tests here reported upon.

Nine in. of fine earth was not a formidable barrier to the emergence of the beetles. Slaked lime failed to kill even the larvæ after an exposure to it for 23 days. It was found that under laboratory conditions the beetles will continue to breed in prunings that are far gone in decay, provided these are not too dry, and even in the presence of slaked lime or quicklime, and that they are able to work their way up through as much as 7.5 in. of fine earth. Not only the adults but even pupæ may remain alive in prunings left on the surface of the ground for as many as 13 days.

"In the light of our present knowledge the only means of control that can be recommended are, from an entomological point of view, (1) burning of prunings; (2) discovery of and elimination of, as far as practicable, breeding grounds in plants other than tea; (3) cultivation and manuring; and (4) prevention, so far as possible, of the infestation of fresh areas."

Descriptions of two parasitic Hymenoptera, S. A. ROHWER (*Proc. Ent. Soc. Wash.*, 16 (1914), No. 3, pp. 141, 142).—*Sympherta mnemonica*, a primary parasite on *Mnemonica auricyanea* on chestnut and oak at Falls Church, Va.; and *Podogaster everivorus*, a parasite of *Evetria* sp., on *Pinus ponderosa* at Fort Bayard, N. Mex., are described as new.

Third annual report of the state bee inspector to the governor of the State of Iowa for the year 1914, F. C. PELLETT (*Ann. Rpt. State Bee Insp. Iowa*, 3 (1914), pp. 126, pl. 1, figs. 63).—This report of the work of the year includes the proceedings of the meeting of the Iowa Bee Keepers' Association, held at Ames, November 17-19, 1914, and the papers presented, namely, Short History of Bee Keeping, by C. P. Dadant (pp. 32-37); Temperature and Humidity in the Wintering of Bees, by E. F. Phillips (pp. 37-56); Wintering

Bees in Iowa, by W. S. Pangburn (pp. 56-60); Fifty Years of Bee Keeping in Iowa, by E. Kretschmer (pp. 60-62); Individual and Cooperative Methods of Marketing Honey, by W. Foster (pp. 62-67); Experience with European Foul Brood, by J. I. Wiltsie (pp. 67-70) and by L. W. Elmore (pp. 70, 71); Experience with American Foul Brood, by D. E. Lhommedieu (pp. 71, 72); Discussion of Experiences with American Foul Brood, by J. W. Stine (pp. 73, 74); Trip Through Quebec, by C. P. Dadant (pp. 74-76); Honey Plants of Iowa, by L. H. Pammel (pp. 76-88); The Value of Bees in Horticulture, B. N. Gates (pp. 89-93); Bees as a Nuisance, J. D. Gustin (pp. 94-98); Basswood Planting, by G. B. MacDonald (pp. 98, 99); The Wild Bees of Iowa, by L. A. Kenoyer (pp. 99-110); and A New Method of Using Split Sections, by L. D. Leonard (pp. 111, 112).

Rocky Mountain spotted fever, L. D. FRICKS (*Pub. Health Rpts. [U. S.], 30 (1915), No. 3, pp. 148-165, figs. 3; abs. in Jour. Amer. Med. Assoc., 64 (1915), No. 5, pp. 439, 440*).—This report deals in large part with the work of eradicating the Rocky Mountain spotted fever tick, *Dermacentor venustus (andersoni)*, during 1914.

Experiments to test the destruction of ticks by two bands of sheep numbering about 1,500 were made in the Bitter Root Valley, Montana, beginning about the middle of April and terminating about the middle of July, when the sheep were sheared, dipped, and returned to their owners. During the experiments sheep of both bands were searched frequently for dead and live ticks, and from the findings it was estimated that over 25,000 adult ticks were destroyed by the 1,500 sheep during the season. It is believed that this experiment shows conclusively that a high percentage of the total adult tick infestation can be destroyed by sheep grazing in one season.

Mites of the genus *Tarsonemus* causing disease on Gramineæ, G. H. CORBETT (*Ann. Sci. Bul. Roy. Agr. Col. Cirencester, No. 4-5 (1914), pp. 93-95, figs. 2*).—In this brief review attention is called especially to a disease of oats caused by *Tarsonemus spirifex*.

A revision of the cestode family Proteocephalidæ, G. R. LA RUE (*Ill. Biol. Monographs, 1 (1914), No. 1-2, pp. 350, pls. 16*).—The first part of this work contains historical data, including synonymy and definitions of the genera considered; a description of the technique employed; the anatomy and histology of the Proteocephalidæ, including characters of diagnostic value; and a key to the better-known genera and species of the family. Descriptions of proteocephalid species follow, together with a comparative table of selected characters of Proteocephalus species; descriptions of proteocephalid species from Amphibia and Reptilia; comparative tables of selected characters of species of Ophiotania and Crepidobothrium; and descriptions of species of Monticellia. This is followed by a discussion of the distribution, life history, and origin of the Proteocephalidæ.

The author concludes that the data presented by various workers show the life history of the proteocephalids to be essentially as follows: "The eggs and some of the ripe proglottids bearing eggs are voided by the host into the water, where they are eaten by an invertebrate, perhaps a worm, an insect larva, or a crustacean, or possibly the eater is a vertebrate, fish, snake, or an amphibian of the same species as the host or different. If the invertebrate or vertebrate furnishes a suitable habitat for the development of the parasite, the six-hooked embryo establishes itself and from it develops a plerocercoid about which the host produces a cyst. If the intermediate host be eaten by a vertebrate which furnishes proper habitat for the adult parasite, the plerocercoid when it is released by the action of the digestive juices from its intermediate host and

from its cyst passes to the intestine and develops into the adult tapeworm. If the final host engulfs material containing eggs of the cestode harbored by itself or its congeners or perhaps by members of other species, the host becomes infected with the plerocercoids, and so it may function as a secondary as well as a primary host for its parasitic species. Cannibalism may be a means in the spread of the parasites harbored. The problems connected with the life history of these parasites must ultimately be settled by experimental methods."

A bibliography of nine pages is appended.

FOODS—HUMAN NUTRITION.

Lectures on food chemistry, compiled by W. KERP (*Nahrungsmittelchemie in Vorträgen*. Leipsic: Akademische Verlagsgesellschaft, 1914, pp. XXXII+579, figs. 26).—This book consists of a compilation of lectures by different authors on various subjects of chemistry of foods and nutrition. Among the topics included are food legislation in the German Empire; the modern physico-chemical basis of food chemistry; recent contributions to the chemical study of cell metabolism; the biology of milk; and a number of questions concerning the analysis and investigation of a number of different food materials.

A study of foods, RUTH A. WARDALL and EDNA N. WHITE (Boston: Ginn & Co., 1914, pp. VII+174, pl. 1, figs. 80).—This book presents the fundamental principles underlying the preparation and preservation of foods. The subject-matter is illustrated by numerous laboratory and cooking experiments. Considerable attention is also given to food requirements, selection of foods, and the relative nutritive value and cost of different food materials. The different cuts of meat are well illustrated.

The food industry, edited by K. VON BUCHKA (*Das Lebensmittelgewerbe*. Leipsic: Akademische Verlagsgesellschaft, 1914, vol. 1, pp. II+891+XV, figs. 41).—This is the first volume of an extensive handbook intended for food chemists, representatives of industries and trades, druggists, physicians, veterinarians, food control officials, and judges. The contents are as follows: Human Nutrition, by A. Kreutz (pp. 1-34); General Discussion of Foods, etc., by K. von Buchka (pp. 35-87); Coffee and Coffee Surrogates, by A. Hasterlik (pp. 91-162); Tea, Tea Surrogates, and Paraguay Tea, by A. Hasterlik (pp. 163-199); Cocoa and Chocolate, by A. Kreutz (pp. 201-250); Tobacco, by H. Witte (pp. 251-298); Vinegar, by H. Witte (pp. 301-371); Meat and Meat Goods, Inclusive of Fish, by A. Reinsch (pp. 375-497); Eggs, by A. Reinsch (pp. 499-514); Edible Fats and Oils, by K. Fischer (pp. 517-700); and Brandies and Cordials, by W. Bremer (pp. 703-890).

The discussions include methods of manufacture and analysis, nature of adulterations, and laws pertaining to food control.

New food preparations, H. WAGNER (*Konserv. Ztg.*, 15 (1914), No. 47, pp. 309, 310).—A summary and digest of data including information regarding commercial products made from bananas, soy beans, malt extracts, gelatin, lecithin preparations, etc.

The egg from the point of view of nutrition, M. L. DELAYE (*Bul. Soc. Salubrité, Prov. Liège*, 16 (1913), pp. 67-89).—This paper discusses in detail the structure and chemical composition of eggs, the changes which they undergo during storage, standards for judging freshness, methods of preservation, food value, consumption in different countries, and methods of judging and sale adopted in the egg-market of Maestricht and other large distributing centers.

[Examination of shellfish] (*Maine Sta. Off. Insp.* 66 (1915), pp. 8).—The data given regarding a large number of samples of oysters, scallops, and clams include the price paid, the weight as purchased, and the percentage of free

liquids and dry solids. The circular also contains information concerning the rules which control the sale of shellfish in the State.

Notes on flour—(1) acidity of flour, (2) natural and artificial bleaching of flour, (3) sulphates and lime in flour, R. T. THOMSON (*Analyst*, 39 (1914), No. 465, pp. 519-529).—Analytical data are presented from which the following conclusions are drawn:

The apparent acidity of flour is not due to free lactic acid. The theory that natural bleaching by exposure to the atmosphere is similar to artificial bleaching by nitrogen peroxid has not been proved, but evidence is presented to prove that nitrous acid is not the active agent in bleaching flour exposed to the atmosphere. It also seems probable that artificial bleaching takes place before any formation of free nitric and nitrous acids.

A method for determining sulphates in flour is described, and some analytical data are also given.

Bulbs of very doubtful value as food, D. I. MURPHY (*U. S. Dept. Com., Com. Rpts.*, No. 4 (1915), p. 61).—Chemical analysis of bread prepared from a mixture of two-thirds wheat flour and one-third powdered tulip or crocus bulbs showed that the nutritive value of the wheat was lessened by the admixture. Among the objections made to the use of these bulbs as a food is the fact that they may easily be mistaken for the poisonous narcissus bulb.

Comparative cooking qualities of some of the common varieties of apples grown in Oregon, AVA B. MILAM and HARRIET B. GARDNER (*Oregon Sta. Bul.* 124 (1915), pp. 36, figs. 19).—The object of this investigation was to determine the relative value of a number of varieties of apples for cooking and some of the general principles underlying the cooking properties. It was also desired to study the relationship of cooking in general to the dessert quality of the apple and to determine whether or not differences in cooking quality are associated with differences of morphology and cell structure. The apples were made into sauce, pies, dumplings, jelly, and marmalade, and the products scored according to standards which are described. As a result of these tests, which were made with 71 varieties of apples, the following general conclusions are drawn:

"Different varieties of apples must be used for certain specific cooking purposes in order to obtain the best product.

"The size of fruit makes but little difference in the cooking quality of apples for sauce. Fruits that are at their prime or even a little overripe are apparently best for sauce.

"There is comparatively little correlation between the scores of apples for sauce and those of the same varieties for jelly. This indicates that the flavor and texture of the jelly are almost entirely dependent upon the chemical composition of the apple rather than its texture and morphological structure.

"Good dessert apples do not necessarily make equally good products when cooked.

"Apples belonging to the same pomological group tend to have similar cooking qualities.

"The sauce-cooking qualities of an apple vary inversely with the proportion of pith area and vascular tissue present, . . . directly as the size of cell, and inversely as the cell cohesion."

Honey and its uses in the home, CAROLINE L. HUNT and HELEN W. ATWATER (*U. S. Dept. Agr., Farmers' Bul.* 653 (1915), pp. 26, fig. 1).—This publication contains some information of general interest regarding honey, but is chiefly devoted to the food value of honey, the economy of honey as a food, and its use in the home, especially in cookery. A large number of recipes are given for the use of honey in the making of bread, muffins, cakes, cookies, desserts, etc.

Ice cream (*Maine Sta. Off. Insp.* 63 (1914), pp. 141-152).—Standards are given for different kinds of ice cream and the results presented, in tabular form, of the examination of samples collected throughout the State during the year 1914. A statement by A. M. G. Soule is appended.

Maté tea, R. BRIEGER (*Pharm. Zentralhalle*, 55 (1914), No. 48, pp. 975-978).—Comparative analyses of coffee, tea, and South American maté tea are reported. The author claims a higher nutritive value for maté tea [Paraguay tea], and recommends its use in the German Army in preference to coffee, tea, and lecithin preparations for producing a temporary stimulating action.

Drugs (*Maine Sta. Off. Insp.* 61 (1914), pp. 89-104).—Analyses are given of a number of samples of drugs. The statement is made that about one-half of the simpler preparations analyzed differed more than 10 per cent from the required standard. This is believed to be the result of carelessness rather than an attempt to perpetrate fraud. A statement by A. M. G. Soule is appended.

Miscellaneous food materials (*Maine Sta. Off. Insp.* 65 (1914), pp. 165-176).—General and specific data are reported regarding the inspection and analysis of a number of samples of miscellaneous food products.

The value and purpose of animal experimentation in meat examination, M. MÜLLER (*Ztschr. Infektionskrankh. u. Hyg. Haustiere*, 16 (1914), No. 3, pp. 115-138).—From the results of his own investigations regarding the toxicity of meat and evidence obtained by other workers, the author concludes that animal (mice) feeding experiments should supplement the chemical and bacteriological examination of meat. Among the reasons advanced in support of this contention is that the presence or absence of certain food poisons can not be determined otherwise than by feeding experiments.

The bacteriology of paper dishes, MARY DUDDERIDGE (*Housewives League Mag.*, 5 (1915), No. 1, pp. 12-15, figs. 3).—This article embodies the results of a study of wood, wood pulp, and water-proof paper food containers. Special attention was given to the study of the bacterial and mold content of these containers.

A study of fruit-jar caps, GAIL M. STAPP (*Mo. Bul. Ind. Bd. Health*, 17 (1914), No. 9, pp. 100, 101).—The results are reported of a comparative study of the old style glass-lined zinc caps which close the jar by pressing tightly on a rubber ring placed on the shoulder of the jar, and a newer style cap in which the rubber ring is placed on the edge of the glass neck of the jar so that the closure is made by the inside glass lining of the cap. Into jars sealed with the old style caps were placed 100 cc. of each of the following solutions: One-half per cent of phosphoric acid, 1 per cent of phosphoric acid; $\frac{1}{2}$ per cent of tartaric acid, 1 per cent of tartaric acid; $\frac{1}{2}$ per cent of acetic acid, 1 per cent of acetic acid; and $\frac{1}{2}$ per cent of nitric acid and 1 per cent of nitric acid. Other jars of the same kind but sealed with the new caps contained like amounts of the same solutions.

After all jars had been inverted and allowed to stand for 6 months it was noted that all the old style caps were corroded. The contents of 5 out of 7 of the jars sealed with the old caps were turbid, showed a decided loss in volume, and contained zinc. The contents of the jar sealed with the newer style caps showed no loss in volume and no turbidity, and contained no zinc, and the caps were not corroded.

Experiments in cheap catering, EDITH SELLERS (*Nineteenth Cent. and After*, 76 (1914), No. 453, pp. 1123-1137).—This article describes two low-priced restaurants or food shops, one in Christiana and one in Vienna.

The Norwegian establishment has been gradually developed since 1857, when a group of business men started a restaurant to provide wholesome food for laboring people at a price which would pay the total cost of buying, preparing,

and serving the food, plus a reasonable return on the capital invested. It was not a success until a department was introduced for the sale of food, both raw and cooked, to be consumed at home, which made possible the purchase of all supplies at wholesale rates. Since then the patronage has steadily increased until over 1,500 persons get their dinners there, 700 go to the cooked-food department, and several hundred others take minor meals in the café or purchase uncooked provisions. Table d'hôte dinners are served at noon in the dining room at the rate of 13.5 and 9 cents.

The People's Kitchens in Vienna have been in operation since 1872 and have served as the models of the Alexandra Trust Dining Rooms in London and similar organizations elsewhere. They now operate restaurants and food shops all over Vienna and serve low-priced, well-prepared meals to 22,000 persons daily, besides providing 5,420 lunches for school children and selling food to several thousands who eat at home. The business, which is entirely self-supporting though managed by a philanthropic association, is so organized that it can at short notice cater to 10,000 unexpected persons. The association is called out in emergencies, such as inundations, epidemics, or other disasters in any part of the country, to take charge of the feeding of the district affected, and is able to respond immediately to such demands.

A shop-girls' restaurant, EDITH SELLERS (*Cornhill Mag., n. ser., 37 (1914), No. 221, pp. 656-665*).—The establishment described in this article is in the heart of the business center of Copenhagen and serves low-priced meals to from 1,200 to 1,800 shop girls, besides selling cooked food. It occupies two floors of a large building, the lower devoted to à la carte service and the upper to table d'hôte dinners. The proceeds are sufficient to cover all expenses, including rent and reasonable returns to the two women who have been entirely responsible for the management, but do not allow of further profits.

Food for polar explorers (*Sci. Amer. Sup., 79 (1915), No. 2037, pp. 36, 37*).—An abstract is given of an article by Sir Ernest Shackleton in which data are given regarding the food supply and diet of explorers in polar regions.

The diet of working men and the principles of nutrition, F. HIRSCHFELD (*Berlin. Klin. Wchnschr., 51 (1914), No. 42, pp. 1721-1725*).—A summary and digest of data which considers principally the use of protein and carbohydrate in the diet.

What are the proximate principles in nutrition? T. HOUGH (*Va. Med. Semi-Mo., 19 (1915), No. 19, pp. 471-475*).—A summary and digest of data with particular reference to the importance of amino acids and vitamins in the diet.

The use of boiled milk in infant feeding, R. H. DENNETT (*Jour. Amer. Med. Assoc., 63 (1914), No. 23, pp. 1991-1995*).—Clinical observations are reported upon infants fed with boiled and unboiled milk. The conclusions drawn by the author are in part as follows:

"The prolonged use of boiled milk if properly administered does not necessarily cause nutritional disorders such as rickets, anemia, malnutrition, or poor musculature. Scurvy may be avoided when boiled milk feedings are given, by the administration of orange juice. Boiled milk does not cause digestive disturbances in normal infants [but] aids in overcoming digestive disturbances. The change from boiled milk to unboiled milk may or may not cause digestive disturbances. Boiled milk is probably more apt to cause constipation than unboiled milk, but in certain cases the constipation may be overcome while on boiled milk, although it is not always overcome when the boiling is stopped. The evidence is not conclusive whether the value of the milk is lessened by boiling or not."

Tri-calcium phosphate as a bone former for nursing infants, F. SCHLOSS and L. FRANK (*Biochem. Ztschr., 60 (1914), No. 5-6, pp. 378-394, figs. 2; abs. in*

Zentbl. Physiol., 29 (1914), No. 3, p. 133).—According to the authors, children, both naturally and artificially fed, were able to utilize tri-calcium phosphate taken with cod liver oil.

The etiology of beri-beri with reference to the total phosphorus metabolism, H. SCHAUMANN (*Arch. Schiffs u. Tropen Hyg.*, 14 (1910), *Beihefte* 8, pp. 397, pls. 12, figs. 2).—In this book the work of others is extensively reviewed and summarized, and the author presents a large amount of original experimental data.

Various theories regarding the etiology of the disease are briefly presented and discussed.

Etiology of beri-beri, II, H. SCHAUMANN (*Arch. Schiffs u. Tropen Hyg.*, 18 (1914), *Beihefte* 6, pp. 7-258).—Continuing the above work, the author reviews a large number of metabolism experiments with laboratory animals (rabbits and pigeons).

On feeding preparations of maize and rice treated in different ways, it was found that the nitrogen balance in beri-beri was negative, indicating a loss of body protein. The total phosphorus balance was negative, and the phosphorus content of the urine was below the normal value.

A study of "antineuritic" substances of natural occurrence led to the conclusion that beer yeast was the most active and rice polishings the next active in preventing the disease. Moreover, the antineuritic property seemed to vary according to the method of preparation.

It is the opinion of the author that the antineuritic substance occurs in foods in very stable compounds and may pass directly into the blood stream of some animals without simplification.

A review of the literature of phosphorus compounds in animal metabolism, E. B. FORBES and M. HELEN KEITH (*Ohio Sta. Tech. Bul.* 5 (1914), pp. 748).—This extensive digest of the literature of phosphorus metabolism has been noted editorially (*E. S. R.*, 32, p. 601).

The value of the calcium balance as an index of calcium metabolism, N. SCHOORL (*Pharm. Weekbl.*, 51 (1914), No. 39, pp. 1216-1219).—A digestion experiment is described in which the amounts of calcium in the food ingested and in the body excretions was determined. In the experimental period of five days the amount of calcium ingested was 10.14 gm. and the amount excreted in the urine and feces 10.11 gm.

Analytical methods and experimental technique are described in detail.

The influence of the melting point of nonemulsified fats on the rate of leaving the stomach, A. VON FEJER (*Biochem. Ztschr.*, 53 (1913), No. 1-2, pp. 168-178, fig. 1; *abs. in Zentbl. Physiol.*, 29 (1914), No. 2, p. 82).—Various fats used in feeding experiments were at intervals removed from the stomach and analyzed to determine the amount which had not passed into the intestine. It was found that the higher the melting point and the greater the viscosity the longer the fats remained in the stomach. The nonemulsified fats left the stomach more slowly than the fat emulsions.

Contributions to the physiology of the stomach.—XXI, The supposed action of the bitter tonics on the secretion of gastric juice in man and dog, A. J. CARLSON ET AL. (*Jour. Amer. Med. Assoc.*, 64 (1915), No. 1, pp. 15-17).—Experiments carried out with men and dogs indicated that bitter tonics acting in either the mouth or stomach have no influence on the secretion of gastric juice, and, as a result of this, on gastric digestion.

The ferments of the pancreas.—III, The properties of trypsin, trypsinogen, and enterokinase, J. MELLANBY and V. J. WOOLLEY (*Jour. Physiol.*, 47 (1913), No. 4-5, pp. 339-360).—In continuation of experiments previously reviewed (*E. S. R.*, 29, p. 662), the authors report considerable information on the prop-

erties of these enzymes and their relations to the conditions prevailing during the processes of digestion.

Trypsin may be preserved for a considerable length of time at 38° C. by salts of the alkaline earth metals, particularly those of calcium. In weakly alkaline solution (sodium carbonate 0.16 normal) trypsin is readily destroyed, but in the presence of free acid (hydrochloric acid 0.025 normal) a small amount of trypsin remains undestroyed even after boiling for five minutes. Albumin, peptone, and amino acids protect trypsin against heat destruction, albumin being most effective in this respect.

Trypsinogen is preserved indefinitely at room temperature in the presence of 0.16 normal sodium carbonate solutions, though it is destroyed by heating in this medium to 65° for five minutes. After heating to 100° for five minutes in the presence of hydrochloric acid (0.025 normal) over 30 per cent remains undestroyed. Neutral salts raise the heat of destruction in varying degrees.

Enterokinase is immediately destroyed by free hydrochloric acid (0.01 normal) at 16°. The presence of calcium chlorid (0.5 normal) increases the heat destruction temperature to 75°.

“Enterokinase and trypsin are destroyed by the hydrochloric acid of gastric juice, but trypsinogen is not acted upon. Trypsinogen is destroyed by pepsin and hydrochloric acid. Trypsin has no effect on enterokinase or trypsinogen. Enterokinase has no effect on trypsin, but activates trypsinogen. Pepsin is destroyed by the alkali of pancreatic juice.”

The ferments of the pancreas.—IV, Steapsin, J. MELLANBY and V. J. WOOLLEY (*Jour. Physiol.*, 48 (1914), No. 4, pp. 287-302).—Continuing the above work, the authors report experimental data which may be summarized as follows:

“The stability of steapsin in alkaline solution is similar to that of trypsin.” The loss of steapsin by fresh pancreatic juice increases rapidly with an increase in temperature above 40° C., all of it being destroyed within five minutes at 60°.

The stability of steapsin in acid solution depends upon the concentration of hydrogen ions in the solution, it being stable in the presence of large amounts of higher fatty acids but quickly destroyed by small amounts of free mineral acids.

“Steapsin can not exist in the presence of free trypsin. Therefore, when pancreatic juice is activated by enterokinase, as trypsin develops steapsin disappears. This fact affords an explanation for the presence of trypsinogen rather than trypsin in fresh pancreatic juice.”

Steapsin is protected from destruction by the addition to activating pancreatic juice of serum or egg albumin.

“The action of steapsin on fat is greatly augmented by bile and bile salts. Electrolytes, such as neutral salts, have no influence on the reaction . . .

“From a consideration of the properties of steapsin and its relation to trypsin it appears that steapsin consists essentially of protein; that the destruction of trypsin in alkaline solution is not due to autodigestion but to its inherent instability; that although the conditions in the small intestine which favor trypsin production are inimical to the continued existence of steapsin, yet the presence of protein in a dietary may facilitate fat digestion by virtue of the capacity of the protein to absorb the first formed trypsin.”

The influence of sugar injections on heat regulation, H. FREUND and E. SCHLAGINTWEIT (*Arch. Expt. Path. u. Pharmacol.*, 76 (1914), No. 5-6, pp. 303-310; *abs. in Zentbl. Physiol.*, 29 (1914), No. 2, p. 94).—The authors conclude from experimental data that the nervous systems for heat regulation and for sugar combustion are entirely independent.

The influence of salts on respiratory metabolism, W. MÄDER (*Untersuchungen über den Einfluss von Salzen auf den respiratorischen Stoffwechsel. Inaug. Diss., Giessen, 1913, pp. 31; abs. in Zentbl. Physiol., 29 (1914), No. 2, p. 89*).—The values are given of respiratory quotients determined for diets containing various inorganic salts.

Metabolism experiments carried out under decreased partial pressure of the oxygen in the air breathed, M. BACHE (*Stoffwechselversuche bei Herabsetzung des Sauerstoff-Partialdruckes in der Respirationsluft. Inaug. Diss., Univ. Halle, 1913; abs. in Zentbl. Physiol., 29 (1914), No. 2, p. 88*).—A decreased partial pressure of oxygen produced changes in metabolism. Long-continued maintenance in this atmosphere induced a certain nitrogen retention, which continued, however, only under these conditions. Maintenance for a few hours each day in oxygen-poor air led to a prolonged disturbance of protein metabolism.

The kinetic system, G. W. CRILE (*Proc. Amer. Phil. Soc., 53 (1914), No. 215, pp. 263-286*).—On the basis of a large amount of clinical and experimental data the author has formulated a theory to explain the conversion of latent energy into kinetic energy. Quotations follow:

"To become adapted to their environment animals are transformers of energy. This adaptation to environment is made by means of a system of organs evolved for the purpose of converting potential energy into heat and motion. The principal organs and tissues of this system are the brain, the suprarenals, the thyroid, the muscles, and the liver." "The brain is the great central battery which drives the body; the thyroid governs the conditions favoring tissue oxidation; the suprarenals govern immediate oxidation processes; the liver fabricates and stores glycogen; and the muscles are the great converters of latent energy into heat and motion. . . . Each is a vital link—each plays its particular rôle and one can not compensate for the other. A change in any link of the kinetic chain modifies proportionately the entire kinetic system, which is no stronger than its weakest link."

A respiration incubator for the study of the energy metabolism of infants, J. R. MURLIN (*Amer. Jour. Diseases Children, 9 (1915), No. 1, pp. 43-58, figs. 7*).—An apparatus is described which is designed for the study of the metabolism of infants. The respiration chamber is large enough to contain an infant one year of age and is maintained at constant temperature by use of an electric heater and cooling coils contained in the air space which surrounds the chamber. Ventilation and measurement of the respiratory quotient are accomplished by a closed system for removing the water vapor and carbon dioxid produced. Oxygen, to replace that consumed by the infant, is admitted automatically by magnetic devices operated by a spirometer. The muscular activity of the infant is measured by means of tambours connected by rubber tubing with recording devices.

Control experiments with diabetic dogs and alcohol experiments showed an average error in the respiratory quotient for all of the daily averages of 1.8 per cent.

ANIMAL PRODUCTION.

Live stock genetics (*Jour. Heredity, 6 (1915), No. 1, pp. 21-31, figs. 5*).—This is a review, by the research committee on animal breeding of the American Genetic Association, of the work in experimental animal breeding now under way at the various state experiment stations.

[Bibliography on animal breeding] (*Ztschr. Induktive Abstam. u. Vererbungslehre, 13 (1914), No. 1-2, pp. (12)-(21), (23), (24)*).—A bibliography of new literature on animal breeding, heredity, anatomy, and physiology.

Prepotency, E. N. WENTWORTH (*Jour. Heredity*, 6 (1915), No. 1, pp. 17-20).—The author contends that the first essential of prepotency is homozygosis in a dominant character. This is opposed to the general belief that prepotency is a quality belonging to individuals rather than characters. He states that "as a matter of fact it is highly improbable that there ever occurred the ideally prepotent animal described by the breeder; that is, one which is able to impress most of his characters upon his progeny in spite of the females to which he is mated. . . . Prepotency is never a property of the individual, but belongs to a certain few characters that are part of the hereditary makeup of the individual, and their condition as to homozygosis or heterozygosis is the entire determining factor. The degree by which one animal is more 'strongly bred' for a character than another animal is this wide degree of purity or hybridity."

The author believes that prepotency is not entirely a property of the male sex, as many breeders contend, but exists in both sexes. It is thought that the linkage or coupling of separate factors in heredity explains observed prepotency and the difference between "breeders of breeders" and "breeders of performers."

Variability of cattle, J. H. W. T. REIMERS (*Jahrb. Wiss. u. Prakt. Tierzucht*, 9 (1914), pp. 132-162, figs. 6).—This reports a biometrical study made of the body measurements of 300 Holstein cows from 2½ to 3 years old.

The effect of lead on the germ cells of the male rabbit and fowl as indicated by their progeny, L. J. COLE and L. J. BACHHUBER (*Proc. Soc. Expt. Biol. and Med.*, 12 (1914), No. 1, pp. 24-29).—In these studies it was demonstrated that the offspring produced by male rabbits which have been poisoned by the injection of lead acetate into the alimentary tract have a lower vitality and are distinctly smaller in average size than normal offspring of unpoisoned males. Similar results were obtained with fowls.

On the ovarian factor concerned in the recurrence of the estrous cycle, F. H. A. MARSHALL and J. G. RUNCIMAN (*Jour. Physiol.*, 49 (1914), No. 1-2, pp. 17-22, figs. 2).—The authors conclude from their experiments that "the occurrence of 'heat' (proestrus and estrus) in dogs does not depend upon the presence of mature (or nearly mature) Graafian follicles in the ovaries. It is equally evident that it is not dependent upon corpora lutea. It must be supposed, therefore, that the ovarian factor in the recurrence of 'heat' resides in some other ovarian element or combination of elements. The ovarian interstitial cells are possibly concerned in the process, but cyclical changes in the condition of these cells have not so far been observed in the dog's ovaries.

"The view which has generally been maintained that the ripening of the Graafian follicles and the onset of menstruation or heat stand to one another in the relation of cause to effect, must be finally abandoned. It is probable that both series of changes are effects of some more deep-seated ovarian phenomenon."

Studies in the blood relationship of animals as displayed in the composition of the serum proteins.—III, A comparison of the sera of the hen, turkey, duck, and goose with respect to their content of various proteins, W. B. THOMPSON (*Jour. Biol. Chem.*, 20 (1915), No. 1, pp. 1-6).—In continuation of work previously noted (E. S. R., 28, p. 875; 30, p. 68), the author has determined the average percentage of insoluble globulin, total globulin, and total albumin in the sera of the hen, rooster, turkey, duck, and goose.

Studies in the blood relationship of animals as displayed in the composition of the serum proteins.—IV, A comparison of the sera of the pigeon, rooster, and guinea fowl with respect to their content of various proteins

in the normal and in the fasting condition, R. S. BRIGGS (*Jour. Biol. Chem.*, 20 (1915), No. 1, pp. 7-11).—This continues the above, giving the average percentage of the various proteins in the sera of the pigeon, rooster, and guinea fowl during normal and fasting periods.

The weights of newborn calves, sheep, goats, and pigs, J. RICHTER and A. BRAUER (*Jahrb. Wiss. u. Prakt. Tierzucht*, 9 (1914), pp. 91-131, pls. 2).—This article reports studies made of the weights of newborn calves, sheep, goats, and pigs, comparing the initial weight with their aftergrowth. A bibliography of 42 references is included.

Texas feeding stuffs; their composition and utilization, G. S. FRAPS (*Texas Sta. Bul.* 170 (1914), pp. 34).—This bulletin contains a discussion of the composition of Texas feeding stuffs, their utilization and values, the calculation of balanced rations, and tables showing the composition, coefficients of digestibility, and feeding values.

Sugar as a feed stuff, F. LEHMANN (*Ztschr. Landw. Kammer Braunschweig.*, 83 (1914), Nos. 34, pp. 360-362; 35, pp. 367-369; abs. in *Mitt. Ver. Deut. Schweinezüchter*, 21 (1914), No. 23, pp. 398-401).—Successful experiments are reported in which swine were fed from 0.25 to 0.5 kg. of sugar per day, together with a grain ration. It is estimated that the sugar effected an average gain of 0.332 kg. per kilogram of sugar fed. It is thought that the sugar raises the digestibility coefficient of the entire ration.

[Fish as a cattle food] (*Nature [London]*, 94 (1914), No. 2355, p. 430).—It is stated that in Shetland and Iceland, dry salt fish is fed to cattle, sheep, and horses. Early experiments by Lawes are cited which demonstrated that fish-fed pigs were fat and well ripened. Heifers which had been on fish diet for six months showed an average increase of weight of 54 lbs. per head as against 70 lbs. for normally fed animals.

The use of fish as cattle food, R. C. WOOD (*Agr. Jour. India*, 9 (1914), No. 4, pp. 356-361).—It was demonstrated that the addition of $\frac{3}{4}$ lb. of ground fish to a basal ration of rice bran when fed to heifers increased their weight practically as much as an ordinary feed. No ill effects followed the addition of fish to the ration for cattle and after a little time no trouble was experienced in getting the cattle to eat it freely. As a fattening feed, it was found not to compare favorably with peanut meal.

The question of the digestibility of turf, S. GOR (*Landw. Jahrb.*, 46 (1914), No. 3, pp. 403-408).—The author reviews investigations on the digestibility of turf and shows wherein it has a depressing influence on the digestibility of the nutrients, the ferments being rendered less efficient when a large quantity of this material is fed.

[Analyses of feed stuffs], R. E. ROSE (*Ann. Rpt. State Chem. Fla.*, 1914, pp. 107-135).—Analyses are reported of cotton-seed meal, beef scrap, bran, middlings, dried beet pulp, velvet beans, oats, chops, wheat, Para grass hay, dried distillers' slop, shipstuff, molasses feed, alfalfa meal, shorts, linseed meal, rice meal, and various mixed and proprietary feeds.

Commercial feeds, J. M. PICKEL (*Bul. N. C. Dept. Agr.*, 35 (1914), No. 10, pp. 73).—Analyses are reported of wheat bran, middlings, shorts, red dog flour, shipstuff, molasses feed, corn, cracked corn, corn chops, corn bran, gluten feed, beet pulp, rice meal, rice polish, rice bran, wheat, oats, wheat screenings, floor sweepings, and various mixed and proprietary feeds.

[Report of] department of animal husbandry (*Oregon Sta. Rpt. 1913-1914*, pp. 21, 22).—In an experiment comparing skim milk and tankage as supplemental feeds for swine, equal nutrients being fed, lot 1 made a total of 669 lbs. gain, consuming 2.72 lbs. of barley and 6.31 lbs. of skim milk per pound of

gain; and lot 2, 608 lbs. gain, consuming 3.31 lbs. of barley and 0.35 lb. of tankage per pound of gain. The cost per pound of gain in lot 2 was 5.84 cts. The value of skim milk for each pound of gain in lot 1 as compared with lot 2 was 28.29 cts.

Two lots of pigs fed a ration of crushed wheat, bran, and tankage, 5:4:1, lot 1 being self-fed on dry feed and lot 2 hand-fed on soaked feed, required per pound of gain 5.12 lbs. and 4.88 lbs., respectively. In a second trial lot 1 consumed 4.18 lbs. of feed and lot 2, 5.37 lbs. of feed per pound of gain. In this experiment the self-feeder lot ate more feed daily and gained more rapidly at a small cost of nutrients than did the hand-fed lot.

Two Duroc Jersey sows with 7-day-old pigs consumed during the time of suckling the pigs 1,220 lbs. of a feed mixture composed of wheat, shorts, and tankage 5:4:1, while the 15 pigs consumed from April 1 to August 15, 3,436.3 lbs. of the feed, representing a total value of \$122.68, or 8.74 cts. per pound of live weight of pigs, estimating the birth cost of the pigs to be \$3.

In an experiment to determine the practicability of utilizing cull ewes for the production of early market lambs, 20 such ewes were fed during the winter in an open yard with a shed, the lambs arriving at irregular intervals. Thirteen lambs averaging 40 lbs. live weight were sold the first part of April and the seven remaining 70-lb. lambs were sold the latter part of June. The ewes cost \$82.42 and the feed \$149.68. After the sale of ewes, lambs, and wool, a loss of \$40.59 had been realized.

One lot of five lambs allowed the run of the entire farm during the winter (December 3 to March 4) and fed in troughs and racks in the open field made an average gain per head of 27.75 lbs., while another lot of six lambs kept in a shed with access to a small outside yard well bedded with straw made an average gain per head of 23.25 lbs. The lambs under shelter did the better during the rainy season, but during good weather the best results were obtained from those outside.

Comparative efficiency for growth of the nitrogen of alfalfa hay and corn grain, E. B. HART, G. C. HUMPHREY, and F. B. MORRISON (*Wisconsin Sta. Research Bul. 33 (1914), pp. 87-107, figs. 4*).—After reviewing the work of previous investigators, an account is given of two years' experimental work. The purpose of the experiments was to determine the rate of nitrogen retention by growing heifers when the source of the nitrogen in the ration was mainly either the corn grain or the whole alfalfa plant.

During 1910-11, two Holstein heifers were fed by the reversal method for 16 weeks, one animal receiving 5 lbs. corn meal, 2 lbs. gluten feed, and 7 lbs. corn stover, and the other 3 lbs. corn stover, 5 lbs. alfalfa hay, 3 lbs. alfalfa meal, and 4.2 lbs. starch.

During 1911-12, two Holstein heifers were fed as before, except that in this case the second heifer in each case received 5 lbs. alfalfa hay, 4 lbs. alfalfa meal, and 5 lbs. starch. The nutritive ratios of the two rations, based on crude digestible protein, were practically the same, but if in the case of the hay the "amid nitrogen" be excluded, then the nutritive ratio becomes 1:12.4. The efficiency of the two rations for growth, based on the nitrogen storage, was essentially the same.

It is concluded from the results obtained that "on the basis of total nitrogen ingested, the utilization of nitrogen for growth was as efficient when the source was from alfalfa hay as when it came from the corn kernel. With high intake of total digestible crude protein, which in the case of alfalfa includes the amid nitrogen, the storage of nitrogen was essentially alike on the two rations.

"There was no sudden decrease or increase in the nitrogen content of the urine or feces when the animals were suddenly changed from one ration to the other. This is evidence that the amid nitrogen was being used in the same way as the true protein nitrogen. It is apparent from our data that full value, at least for growth, can be given to the total nitrogen of alfalfa hay. The amid nitrogen should not be considered worthless. . . . With growing heifers there was no very concordant rise in creatinin output with increased storage of nitrogen. This precludes the possibility of using this index for these animals as a measure of the efficiency of a given source of nitrogen to produce nitrogen storage."

Steer feeding experiments, W. H. TOMHAVE and C. W. HICKMAN (*Pennsylvania Sta. Bul. 133 (1914), pp. 245-272, figs. 10*).—Five lots of 12 two-year-old steers, each weighing approximately 900 lbs. per head, were fed during two periods of 56 and 84 days, respectively, with the following results:

Summary of steer-feeding experiments.

Lot.	Period.	Average daily feed per steer.								Average daily gain per steer.	Dry matter per pound of gain.	Cost per pound of gain.	Loss per steer.	Price received per bu. of corn after paying for other feeds.
		Corn stover.	Mixed hay.	Alfalfa hay.	Corn silage.	Wheat bran.	Ear corn.	Shelled corn.	Corn - and - cob meal.					
		Lbs.	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.	Cents.		Cents.
I	1.....	2.78	9.70	.....	.....	3.27	9.94	.....	.....	1.71	12.55	11.80	\$7.34	37.3
	2.....	1.31	9.66	.....	.....	4.09	.....	.....	12.33	1.69	13.21	13.79		
II	1.....	.....	.....	.....	47.49	.....	.....	.....	.....	2.31	1.88	9.25	1.02	63.6
	2.....	.....	.....	.....	30.63	.....	a 11.91	b 11.99	.....	2.75	1.81	11.53		
III	1.....	.....	.....	4.85	40.42	.....	.....	.....	.....	1.50	11.27	7.16	2.16	56.2
	2.....	.....	.....	4.96	25.58	.....	a 12.07	b 11.98	.....	1.80	11.94	11.17		
IV	1.....	.....	9.89	.....	19.47	.....	.....	.....	.....	2.30	1.62	10.17	1.05	63.3
	2.....	.....	5.06	.....	19.81	.....	a 12.04	b 11.98	.....	2.69	2.05	10.89		
V	1.....	.....	.....	4.37	37.58	.....	.....	.....	.....	2.29	1.66	10.67	4.23	42.9
	2.....	.....	.....	4.78	21.37	.....	a 12.01	b 11.94	.....	2.69	1.97	11.62		

a 56 days.

b 28 days.

It is concluded that "corn silage at \$3.50 per ton is slightly more economical when used as the sole roughage for steers, than a combination of mixed hay and silage in which the silage is limited to 20 lbs. per head daily when hay, costing \$12 per ton, is freely fed.

"A ration of mixed hay and corn stover as roughage, with broken ear corn, or corn-and-cob meal, and bran as grain, when fed throughout the entire feeding period, is not economical in Pennsylvania. The cattle fed this ration through the entire feeding period produced 100 lbs. of gain at an average cost of \$12.97, while those receiving no grain during the first 56 days except cotton-seed meal and what grain was present in the silage, made 100 lbs. of gain at the average cost of \$10.48. Wheat bran as a source of protein at \$25 per ton is much more expensive than cotton-seed meal at \$34 per ton. The additional cost of grinding corn is not repaid by greater gains from steers.

"Alfalfa hay at \$15 per ton, when fed at the rate of 5 lbs. per 1,000 lbs. live weight, in combination with corn silage, is not so efficient as a source of protein as 2½ lbs. of cotton-seed meal per 1,000 lbs. live weight daily at \$34 per ton. The feeding of 5 lbs. of alfalfa hay with 2½ lbs. of cotton-seed meal per 1,000 lbs. live weight daily as a source of protein in a ration of corn silage and

corn is not now economical. Alfalfa hay fed in combination with corn silage during the first 56 days, with corn added to the ration for the balance of the period, reduced the cost of gains, but also decreased the rate of gain as compared with the ration differing by the addition of cotton-seed meal.

"Corn silage at \$3.50 per ton as the sole roughage is more economical than corn silage and alfalfa hay combined when alfalfa hay costs \$15 per ton.

"The cost of producing a pound of gain was considerably less during the first period, when roughage only was fed, than during the second period, when grain also was fed.

"Cattle receiving no corn silage but fed corn from the beginning of the experiment consumed more dry matter daily than those fed corn silage without corn."

Cottonseed meal for feeding beef cattle, W. F. WARD (*U. S. Dept. Agr., Farmers' Bul. 655 (1915), pp. 8*).—This is a popular review of work previously reported from other sources, giving the results of experiments in feeding cotton-seed meal to beef cattle in varying proportions and offering suggestions for its profitable use. "If cotton-seed meal does not cost over \$34 a ton, it can probably be used to advantage in wintering the breeding herd. . . . Cotton-seed cake can be used very profitably as a supplemental feed for fattening cattle on pasture. Five times as many farmers should be using cotton-seed meal as are doing so at the present time."

Jersey-Angus cattle, A. H. KUHLMAN (*Jour. Heredity, 6 (1915), No. 2, pp. 68-72, figs. 6*).—Breeding trials being conducted by F. B. Samuelson in England are reported in which Jersey cows were mated with an Angus bull. The F_1 individuals were mated, as were also the F_2 individuals. The crossbred cows of the F_1 generation showed a high yield of milk and milk fat, their udders were very uniform and good-sized, and they were more hardy than their dams, requiring less close housing during the winter. The F_2 individuals showed marked variations in conformation and color, indicating a segregation and recombination of the characters of the original parents. It is stated that the Jersey-Angus crosses bring as good prices as most beef cattle, and the possibilities of establishing a new breed based upon this cross are being considered.

Shorthorn cattle in Missouri, B. O. COWAN (*Missouri Bd. Agr. Mo. Bul., 12 (1914), No. 12, pp. 91, figs. 18*).—This is a history of the development of the Shorthorn breed of cattle in Missouri and includes a list of Shorthorn breeders in that State.

The present status of the cattle industry in Canada, H. S. ARKELL (*Internat. Inst. Agr. [Rome], Mo. Bul. Agr. Intel. and Plant Diseases, 5 (1914), No. 10, pp. 1255-1263*).—A statistical review of the cattle industry in Canada, showing the distribution of dairy and beef cattle in the various Provinces, the exports and imports of cattle and beef, and the status of the various record associations.

Cattle raising in the Belgian Kongo, F. KOLBE (*Jahrb. Wiss. u. Prakt. Tierzucht, 9 (1914), pp. 208-222, figs. 5*).—A general discussion of the native breeds of cattle found in the Belgian Kongo.

The value of castration of Deccan bullocks, J. B. KNIGHT (*Dept. Agr. Bombay Bul. 62 (1914), pp. 6, pls. 2*).—In this experiment with Deccan bullocks, it was demonstrated that neither early nor late castration materially affected the weight of the bullocks. There was a greater proportionate development in the hind quarters of early-castrated than of late-castrated animals. The strength and hardiness were not impaired by early castration, while the docility was markedly improved and the activity was greater.

The breeds of sheep of the central Pyrenees, GIRARD (*Rev. Vet. [Toulouse]*, 39 (1914), Nos. 7, pp. 402-412; 8, pp. 460-472; 9, pp. 523-532, pls. 2, figs. 7).—An account of the native breeds of sheep of the central Pyrenees, their breed characteristics, and utility value.

Corriedale sheep in United States (*Jour. Heredity*, 6 (1915), No. 2, p. 96).—A brief account of a recent importation of 10 Corriedale rams and 54 ewes, recently made by the U. S. Department of Agriculture from New Zealand. "The breed, which originated in the Province of Canterbury, New Zealand, in the late seventies and was long known officially as 'inbred half-breds,' resulted from a Lincoln × Merino cross and in part from an English Leicester × Merino cross. It interests the stockman because it offers a combination of wool and mutton qualities, and the genetist because it appears to breed fairly true in spite of the short time that has elapsed since its formation. In appearance it is very nearly a blend between the two parents, and there seems to be little segregation of characters in the breed at present."

The sheep-killing dog, V. O. McWHORTER (*U. S. Dept. Agr., Farmers' Bul.* 652 (1915), pp. 13, figs. 3).—It is estimated that the total annual loss in numbers of sheep killed by dogs in 36 farm States, not including the western division, is 107,760 head, which although less than 1 per cent of the total number of sheep in these States, is sufficient to decrease materially the possible profits and to discourage the development of the industry.

From replies received from crop correspondents it is estimated that the present number of sheep in these States can be increased by 150 per cent without displacing other live stock on farms. These replies furthermore indicate that sheep raising is considered profitable but that dogs are the main barrier to keeping them. The author advocates a higher dog tax, thus reducing the number of superfluous dogs, and the adoption of more effective state dog laws. An outline of what is deemed a suitable dog law is suggested. This provides for the taxation of dogs, the identification of licensed dogs, dealing with stray or sheep-killing dogs, and compensation to the sheep owners for losses. An effective dog-proof fence is described.

The age of goats according to their teeth, SCHEUNPFLUG (*Berlin. Tierärztl. Wchnschr.*, 30 (1914), No. 28, pp. 503, 504; *abs. in Internat. Inst. Agr. [Rome]*, *Mo. Bul. Agr. Intel. and Plant Diseases*, 5 (1914), No. 10, pp. 1337-1339).—The data found in the literature on the replacing of the teeth in sheep are compared with the author's observations on goats.

It appears that the termination of the period during which the incisors are replaced is nearly the same in goats as in early-maturing sheep. The period between the replacing of the first and second pairs of incisors in sheep is about two months shorter than in goats, but the interval between the second and third pairs is shorter in goats. The temporary molars are replaced earlier in goats than in sheep, in goats shortly before the cutting of the third molar, in sheep only after the cutting of the latter or at the same time.

A detailed description is given of the appearance of the teeth of the goat up to three years of age.

The digestibility of maize consumed by swine, S. C. GUERNSEY and J. M. EVVARD (*Biochem. Bul.*, 3 (1914), No. 11-12, pp. 369-372).—This is a preliminary report of work conducted during 1909, 1910, and 1911 at the Iowa Experiment Station, in which four lots of five animals each of 12-month-old 200-lb. hogs and of 80-day-old 70-lb. hogs were fed corn in five different forms, and two digestion trials of 10 days' duration made with each lot. The results are summarized in the table following.

Digestion coefficients of corn fed to hogs.

Method of preparation.	Heavy-weight hogs.						Light-weight hogs.					
	Dry matter.	Protein.	Ether extract.	Nitrogen-free extract.	Crude fiber.	Ash.	Dry matter.	Protein.	Ether extract.	Nitrogen-free extract.	Crude fiber.	Ash.
Whole grain, on cob.....	85.42	74.79	66.85	90.67	19.65	24.85	88.86	78.18	72.42	93.59	43.80	20.50
Shelled grain, dry.....	86.48	74.39	64.22	91.56	43.46	23.88	88.05	76.00	73.85	93.16	45.42	7.36
Shelled grain, soaked.....	85.40	74.51	58.18	90.66	40.85	15.98	87.20	76.24	62.87	92.78	45.17	7.32
Ground grain, dry.....	87.25	73.14	65.03	92.65	39.72	20.64	87.22	76.60	59.40	92.88	42.00	10.92
Ground grain, soaked.....	88.39	77.13	59.57	93.37	39.40	18.05	85.91	70.50	67.91	92.11	38.92	-5.29

It is stated that these figures are in close agreement with those obtained in similar experiments at the Ohio Station (E. S. R., 31, p. 268).

In the 1909-1910 series of experiments a correlation between the digestibility and time required for digestion was found, which was shown by the average length of time required for charcoal to traverse the digestive tract. For the light-weight hogs the average time required with the respective feeds was 70.5, 54, 48, 57, and 40.5 hours, the average digestibility of the dry matter being 90.96, 88.8, 88.09, 88.4, and 84.52 per cent, respectively. For the heavy-weight hogs the average time required was 38, 48, 36, 36, and 50 hours, respectively, and the average digestibility of the dry matter was 86.29, 87.04, 84.97, 86.46, and 88.61 per cent, respectively. The 1911 series of experiments do not corroborate these results and hence they are not taken as conclusive.

These digestion trials agree fairly well with former feeding trials (E. S. R., 22, p. 174) which demonstrated that light-weight hogs weighing less than 200 lbs. make the most rapid gains with whole corn on the cob, in the natural state, while heavy-weight swine make the most rapid gains with the soaked shelled and soaked ground grain.

[Swine-feeding experiments], M. POPP and W. FELLING (*Deut. Landw. Presse*, 41 (1914), No. 82, pp. 901, 902).—In an effort to find suitable substitutes for barley in the fattening ration, 8 lots of 110-lb. pigs were fed 80 days as follows: Lot 1, fish meal and barley meal, lot 2, fish meal and barley meal with steamed potatoes, lot 3, corn-blood feed and barley meal with steamed potatoes, lot 4, yeast and barley meal with steamed potatoes, lot 5, yeast, sugar feed, and barley meal, lot 6, fish meal, barley meal, and a proprietary feed, lot 7, fish meal, barley meal, a proprietary feed, and potatoes, and lot 8, fish meal, barley meal, and rye meal.

Considering the gains made, the cost of gain, the quality of the flesh, and the feed requirements, the lots ranked as follows: 2, 7, 3, 8, 6, 1, 5, 4.

The swine-raising industry in Canada, J. B. SPENCER (*Internat. Inst. Agr. [Rome]*, Mo. Bul. Agr. Intel. and Plant Diseases, 5 (1914), No. 9, pp. 1154-1159).—This is a statistical account of the swine-raising industry of Canada, discussing the early development of the industry and the present status of the export trade, especially of bacon.

It appears that there has been a decline in exports, due largely to the increased consumption in Canada. The exports of hog products have until quite recently been almost entirely to Great Britain, but with the throwing open of the markets of the United States increased quantities of Canadian bacon, hams,

and pork have come to this country. There has been a marked increase in the pedigree registration of the bacon breeds of hogs and a material decrease in the fat-hog breeds during the past few years.

Swine, G. E. DAY (*Ontario Dept. Agr. Bul. 225 (1914), pp. 80, figs. 28*).—A general treatise on the feeding, care, and management of swine.

The breeds of horses in Norway, C. WRIEDT (*Abs. in Internat. Inst. Agr. [Rome], Mo. Bul. Agr. Intel. and Plant Diseases, 5 (1914), No. 9, pp. 1194-1196*).—An account of the origin, development, and breed characteristics of the horses of Norway, one being the native breed known as Fjord, the other a special breed developed in eastern Norway and known as Gudbrandsdal.

[Report of] poultry section (*Minnesota Sta. Rpt. 1914, p. 37*).—From feeding records kept of a flock of ducks "it would appear that in flocks of 20 or more the feeder would realize about 25 cts. per hour for his time, with increased returns as the number is increased. Ducks, when fed unstintingly, are ready for market in from 9 to 11 weeks."

Records kept of the cost of growing the chick during the fattening age "indicate that at this, the most expensive period of production, the cost of feed exceeds one-half the lowest market price, which in this locality is usually about 16 cts. per pound live weight for prime young stock."

A flock of White Leghorns kept on range and fed by the hopper method doubled in weight in 57 days at a feeding cost of less than 7 cts. per pound gained. "At the low average price of 20 cts. per dozen for the eggs produced, a flock of 39 White Leghorns shows receipts of over 30 per cent above the maximum feeding cost. That a younger flock and one that had been confined for a shorter space of time would have shown a larger egg yield is certain."

[Report of] poultry husbandry department (*Oregon Sta. Rpt. 1913-1914, pp. 22-24*).—It has been found that the humidity surrounding eggs during incubation has a highly important function to perform and that this, taken in connection with ventilation of the incubator and the supply of oxygen, is probably the factor to be reckoned with in solving the problem of losses in connection with the hatching of chickens.

Results of crossbreeding experiments with Plymouth Rocks and Leghorns indicate that it is possible to produce a bird with a higher egg yield than the average of either parent, while the meat quality is also such as better to meet the needs of the consumer.

Experiments on egg laying in different breeds of poultry (*Abs. in Internat. Inst. Agr. [Rome], Mo. Bul. Agr. Intel. and Plant Diseases, 5 (1914), No. 9, pp. 1199, 1200*).—In these trials conducted at the Royal Veterinary and Agricultural College at Copenhagen, of the 7 breeds represented the Leghorns took first place for both number and total weight of the eggs. Most hens laid the greatest number of eggs during the first or second year, but there were some that produced more in the third year. As for summer and winter laying, there was no large difference between Plymouth Rocks and Leghorns, the former laying a slightly greater percentage of their eggs during the winter months than the latter. The older hens laid a smaller percentage of their eggs during the winter months than the younger ones.

The weight of individual eggs was greater for Minorcas and Leghorns than for White Wyandottes and Houdans, and appeared to increase with the age of the hens. The weight of the birds increased with age, but only up to the end of the third year, when they were fully grown. There appeared to be a growth from autumn to spring and a sinking from spring to summer. This was especially noticeable in good layers, the body weight of which decreased to a greater extent than that of poor layers during the spring months when egg laying was more active.

Broodiness, which was more frequent among Plymouth Rocks than among Leghorns, was most pronounced in the best layers. It was found that 16 days after mating the hens still laid fertile eggs. When mating was repeated after a period of more than 16 days, the first fertile egg was generally laid 3 days and sometimes 4 days later. It was found possible to influence the color of the eggshell by pairing a cock of a breed which has yellow or brown eggs with a hen of another breed that lays white eggs, or vice versa, the breed of the hen alone being responsible for the color of the eggshell.

Winter egg production, HELEN D. WHITAKER (*Washington Sta. Popular Bul.* 76 (1914), pp. 15).—This gives general information on the selection, housing, care, feeding, and management of poultry for winter egg production.

How to care for the little chick, E. L. ANDREWS (*West Virginia Sta. Circ.* 11 (1914), pp. 4).—General information on the care of young chicks.

Experimental studies of hybridization among ducks and pheasants, J. C. PHILLIPS (*Jour. Expt. Zool.*, 18 (1915), No. 1, pp. 69-143, figs. 9).—This article reports hybridization experiments in which a study was made of the plumage characters in wild species of birds, this being almost wholly an investigation into the inheritance of male secondary sex-characters.

It was found that characters often apparently clear-cut and antagonistic do not segregate clearly. "There is some evidence that in closely related geographical races there is a nearer approach to orthodox Mendelism, but this is never reached, even in back crosses, except occasionally in isolated characters or in the more undifferentiated plumages of the female sex. In species with unrelated character complexes there are only slight tendencies to a greater variation in F_2 than in F_1 , as is shown in the pintail \times mallard cross, or the Australian \times mallard cross. Such variation, comparable to that seen in size characters, may be explained as the manifestation of factor complexes, outwardly expressed in plumage characters, but not by any means necessarily specific units for these epidermal structures alone. . . .

"Sex-linked inheritance is probably a feature of domestic races in birds. In wild species thus far examined there is no clear evidence of unequal transmission by the sexes. Both sexes can carry the characters of the opposite sex through several generations without an additional 'dose' of the character in question."

Hints on goose culture, HELEN D. WHITAKER (*Washington Sta. Popular Bul.* 83 (1915), pp. 4).—General information on the feeding, care, and management of geese.

Some factors affecting the weight, composition, and hatchability of hen eggs, H. ATWOOD (*West Virginia Sta. Circ.* 9 (1914), pp. 4).—This is a popular account of material previously reported (*E. S. R.*, 31, p. 270).

A study of the relation of the chemical composition of hens' eggs to the vitality of the young chick, L. J. CROSS (*Thesis, Cornell Univ.*, 1912, pp. 16).—In this work the author attempted to determine the relation of the vitality of the chick to the chemical composition of the egg, and to control the composition of the egg. The results are summarized as follows:

"The work on the coloring of the parts of the eggs by feeding dyes to the hen indicates that the fat found in the albumin region of the incubated egg is derived not wholly from the yolk, but from another source, the albumin itself. The percentage of fat in the yolk of the weak chick is in some cases less and sometimes more than in the yolk of the strong chick. The weak chick is equally as rich in phosphorus as the strong chick. The phosphorus content of the egg varies but little. There is no increase in the phosphorus content of the egg

when the hen is fed inorganic phosphorus. Hens on range do not produce eggs different in composition from those on bare yard.

"There is a variation in the eggs of individual hens in the content of protein and in the content of fat, but the eggs produced by each individual are quite constant in composition. The sum of the percentage of the fat and of the protein in eggs varies but little. In feeding a ration high in fat, or a ration high in protein, there is no material change in the characteristics of the hen as regards the amount of fat and protein in the egg. There seems to be no relation between the protein or fat content of the egg as regards its hatching power or the vigor of the young chick."

An abnormal hen's egg, F. E. CHIDESTER (*Amer. Nat.*, 49 (1915), No. 577, pp. 49-51, figs. 2).—A description is given of a "gourd-shaped" egg having a constricted yolk surrounded by apparently normal albumin. This particular abnormality is thought to have been caused by a constricted oviduct rather than from the fusion of two eggs during apposition, induced by antiperistalsis.

The interior quality of market eggs, E. W. BENJAMIN (*New York Cornell Sta. Bul.* 353 (1914), pp. 46, pls. 8, figs. 14).—Topics discussed in this bulletin are the physiology of egg production; the structure of the normal egg; the interior quality of a normal fresh egg; the internal and external factors affecting the interior quality of eggs; and suggestions to producers, dealers, and consumers. A bibliography and several colored illustrations of market eggs are included.

The community egg circle, C. E. BASSETT and W. H. KERR (*U. S. Dept. Agr., Farmers' Bul.* 656 (1915), pp. 7).—This bulletin contains general information on cooperative egg marketing and gives forms for use in organizing, managing, and auditing a community cooperative egg association.

Sodium silicate as an egg preservative (*Minnesota Sta. Rpt.* 1914, pp. 26, 27).—It is concluded from two seasons' work that eggs are not appreciably affected within a much larger range of alkalinity than that exhibited by market samples of sodium silicate solution. Deposition of silicate from solution is dependent upon the exposure to air and the amount of carbon dioxide present. Deposited silicate may be redissolved by boiling with a little lye, and such solutions are equal in every respect to fresh solutions.

Fur farming in Canada, J. W. JONES ET AL. (*Ottawa: Com. Conserv.*, 1914, 2. ed., rev. and enl., pp. IX+278, pls. 28).—A revised and enlarged edition of this work, previously noted (*E. S. R.*, 29, p. 373).

DAIRY FARMING—DAIRYING.

Dairy farming, O. E. REED (*Kansas Sta. Circ.* 45 (1915), pp. 26, figs. 9).—This circular contains general information on the dairy breeds, the selection, feeding, care, and management of the dairy herd, together with directions for making the Babcock test.

Dairying in Switzerland, W. WRIGHT (*Jour. Agr. [New Zeal.]*, 10 (1915), No. 2, pp. 140-147, figs. 2).—An account of several of the prominent dairy farms and manufacturing concerns of Switzerland, together with a description of the method of manufacturing Emmental cheese.

On the importance of meadows and pastures for the dairy establishment, O. LAXA (*Milchw. Zentbl.*, 43 (1914), No. 6, pp. 145-153).—The author shows wherein the geological character of the land influences the mineral content of its vegetation and how in turn this affects the mineral content of the milk and its value for cheese making. It is further shown that although the bacterial content of the milk of pasture-fed cows is much lower than that of stall-fed

cows, the bacteria that the milk does contain are of a desirable kind, favorably influencing the flavor and character of the dairy products.

The comparative efficiency for milk production of the nitrogen of alfalfa hay and corn grain, E. B. HART and G. C. HUMPHREY (*Wisconsin Sta. Research Bul. 33* (1914), pp. 108-119, figs. 3).—This material has been previously reported from another source (E. S. R., 32, p. 74).

Feeding experiment with milch cows, or the value of beer yeast, V. RENNER (*Wchnschr. Brau.*, 31 (1914), No. 49, pp. 473-476).—In this experiment fresh beer yeast when fed in quantities of from 12 to 17 kg. (26 to 37 lbs.) per head per day as a supplementary feed to milch cows increased both the milk yield and the milk fat percentage over that obtained by a ration in which either rape seed cake or palm kernel cake was used. The composition of the yeast is given as water 87.92, protein 6.48, fat 0.06, nitrogen-free extract 4.56, fiber 0.14, and ash 0.84 per cent.

The effect of repeated injections of pituitrine on milk secretion, S. SIMPSON and R. L. HILL (*Amer. Jour. Physiol.*, 36 (1915), No. 3, pp. 347-351).—This material has been noted previously from another source (E. S. R., 32, p. 268).

A Danish cow testing association, J. J. DUNNE (*Hoard's Dairyman*, 49 (1915), No. 11, p. 424).—From data presented in the annual report of the cow testing association on the Island of Funen, Denmark, the author concludes that it cost more to produce 1 lb. of milk rich in fat than it did to produce 1 lb. of milk poor in fat, but that 1 lb. of butter was more cheaply produced from the milk rich in fat.

The average Jersey cow consumed about 1,000 feed units less than the average red Danish cow, and yielded 22 lbs. more of butter per year. The Jersey was the more economical butter producer, but the red Danish with a 3.3 milk fat percentage was the more economical as a milk producer.

In milking a cow on different occasions and from different teats it was found in a single milking the first streams contained 0.25 per cent of fat, this increasing until the last few streams tested 9.4 per cent.

Data are presented showing the remarkable improvement that has been made during the past ten years in the producing capacity of the dairies under the stimulus of the cow testing association.

Rules and regulations governing the operation of the Babcock test (*Iowa Dairy and Food Com. Bul. 11* (1915), pp. 6).—General information on the use of the Babcock test.

Coming standards of market milk, G. L. NOBLE (*Milk Dealer*, 4 (1915), Nos. 5, pp. 32-35; 6, pp. 14-18).—A discussion of the milk standards of the various cities and the tendency toward more rigid municipal control.

The bacteriological control of public milk supplies, W. D. FROST (*Trans. Wis. Acad. Sci., Arts, and Letters*, 17 (1914), pt. 2, No. 6, pp. 1305-1365, pls. 2, figs. 8).—After a detailed description of the bacteriological methods of milk analysis used, the author discusses the results of his studies of the different grades of milk obtained from various sources. Under winter conditions the raw milks had an average bacterial content of 2,000,000 per cubic centimeter, those pasteurized in bottles 532,000, inspected milk 159,560, and certified milk 20,000.

The number of colonlike bacteria, i. e., those fermenting lactose with the formation of gas, were found in the various grades of milk in the order: Raw milk, inspected milk, certified milk, and pasteurized milk. *Bacterium welchii* was found to be present in considerable numbers in raw milks, 3.2 being the average number found to each 20 cc. It was found with practically equal frequency in pasteurized milks, less frequently in inspected milks, and

rarely if ever in certified. It is thought that the presence of this organism, 3 to 4 per cubic centimeter, is an indication of contamination. It is said that a high spore count in a pasteurized milk indicates either a poor raw milk, a low pasteurizing temperature, or contamination with heat-resisting forms after pasteurization. Certified milk and good inspected milk had surprisingly few spore forms.

The rate at which colonies on agar plates incubated at 21° C. develop may be used to differentiate different grades of milk, being more rapid in the raw than in the pasteurized or certified milks.

In a study of the curd produced by milks of the various classes at 37° it was found that raw and pasteurized milks all promptly formed lactic acid curds, while the inspected and certified milks more frequently formed sweet or gaseous curds.

A number of milks were heavily seeded with *Bacillus coli* and then pasteurized at 60° for 20 minutes. By this procedure it was found impossible always to kill all of the *B. coli* present.

Bacteriological inquiry on sterile milk sold in Brussels, H. KUFFERATH (*Ann. Gembloux*, 24 (1914), No. 8, pp. 417-424; *abs. in Internat. Inst. Agr. [Rome]*, Mo. Bul. Agr. Intel. and Plant Diseases, 5 (1914), No. 11, p. 1511).—From his observations the author concludes that the maximum limit for the number of bacteria allowable in sterile milk should be about 50,000 per cubic centimeter, estimated by counts on gelatin plates kept for three days at a temperature of 38° C. At the same time no injurious bacilli such as *coli* and tuberculosis forms must be allowed.

Relation of the number of *Streptococcus lacticus* to the amount of acid formed in milk and cream, P. G. HEINEMANN (*Jour. Infect. Diseases*, 16 (1915), No. 2, pp. 285-291, fig. 1).—From his study the author concludes that "the amount of acid formed in the souring process of milk or cream is not dependent solely on a definite number of bacteria of the *S. lacticus* group. Temperature and the presence of other bacteria may influence the result. In raw milk or cream, or in raw milk or cream inoculated with cultures of the *S. lacticus*, the number of bacteria increases to a given point and then decreases. At 37° C. the maximum is reached after 24 hours and at lower temperature after several days.

"Coagulation of milk or cream is not solely dependent on a definite amount of acid or a definite number of bacteria. This absence of definite relation between coagulation, on the one hand, and acid and number of bacteria, on the other hand, may be due to the kinds of bacteria present, the kind of acid formed, and the activity of the enzymes produced by bacteria. At 37° extraordinarily high amounts of acid may be produced after several days, due probably to the activity of enzymes produced by the *S. lacticus* and to the presence of members of the group of lacto bacilli."

Milk poisoning due to a type of *Staphylococcus albus* occurring in the udder of a healthy cow, M. A. BARBER (*Philippine Jour. Sci., Sect. B*, 9 (1914), No. 6, pp. 515-519).—This is an account of milk poisoning in the Philippine Islands, where acute attacks of gastroenteritis were produced by a toxin elaborated by a white staphylococcus which occurred in almost pure culture in the udder of a cow. The fresh milk was harmless, and the toxin was produced in effective quantities only after the milk had stood some hours at room temperature. Culturally the toxin-producing staphylococcus differed little from a nontoxin-producing strain, except that the former produced acid in mannite and maltose agars.

It is said that "cases of gastroenteritis occurring in the Tropics and in the warm season elsewhere may be due to a toxin of similar origin, especially

where fresh milk is not properly refrigerated before use. This is the more probable since staphylococci of various types commonly occur in the udders of apparently healthy cows."

Premature curdling of milk during a thunderstorm, R. WERNICKE (*Mitt. Landw. Inst. Leipzig, No. 12 (1914), pp. 97-129*).—In tests made of samples of milk taken from five cows during a thunderstorm it was found that in several cases an increase in germ content occurred at the time of the storm, while in other cases it occurred several hours previous to the storm. It was evident that the weather conditions were conducive to bacterial infection.

These observations correspond to the results obtained by Zieschang in contact-infection experiments with milk pails and bottles. These changes were noted, even though there was no perceptible smell of ozone in the air. The raising of the air temperature is given as another probable cause for the premature curdling of milk during thunderstorms.

Clarification of milk, B. R. WRIGHT (*U. S. Patent, 1,122,457, Dec. 29, 1914; abs. in Jour. Soc. Chem. Indus., 34 (1915), No. 4, p. 196*).—"Milk is delivered into the center of a rotating centrifugal drum and passes through narrow passages to a peripheral space where the heavier impurities are deposited. The milk is then returned, in the form of a number of sheet-like streams, through other narrow passages toward the center of the drum and the outlet. Clarification is thus effected without materially changing the distribution of the butter fat globules in the milk."

Cows' milk for infants in Saxony, E. W. THOMPSON (*Daily Cons. and Trade Rpts. [U. S.], 17 (1914), No. 155, pp. 65-68*).—This is the original of an article previously noted (*E. S. R.*, 31, p. 573).

Goat's milk and its uses (*Food and Drugs, n. ser., 3 (1915), No. 1, pp. 20-24*).—This article discusses the characteristics and composition of goat's milk and its value as a food for infants and invalids.

Making whey butter at Cheddar cheese factories, J. L. SAMMIS (*Wisconsin Sta. Bul. 246 (1915), pp. 3-24, figs. 6*).—This bulletin describes in detail the source of income, expense, profit, and various practical methods of conducting a whey separating and churning business. It is stated that the quality and value of whey cream are largely determined by the sanitary conditions of milk production and the care given the cream after separating. Whey cream should contain 50 or 60 per cent of fat. It should be skimmed early, cooled quickly, churned promptly with from 75 to 100 per cent of good starter, and kept at a low temperature throughout to insure the best results. Churning is not deemed so profitable as separating whey cream, and therefore the smaller factories usually prefer to sell to a central churning station or to a regular creamery.

Ice cream standards, W. B. BARNEY (*Proc. Assoc. Amer. Dairy. Food and Drug Officials, 13 (1914), pp. 226-233*).—The author discusses the feasibility of a fat standard for ice cream, believing that as far as it goes it is very practical, but that alone it is not sufficient. It is stated that the use of fillers and binders should be permitted in the manufacture of ice cream, provided they are of good quality.

Report to the local government board upon the effects of certain condensing and drying processes used in the preservation of milk upon its bacterial contents, S. DELÉPINE (*Rpts. Local Govt. Bd. [Gt. Brit.], Pub. Health and Med. Subjs., n. ser., No. 97 (1914), pp. 49, pls. 7; abs. in Dairy, 27 (1915), No. 314, p. 44*).—In his studies the author found that the total number of bacteria present in mixed cows' milk, such as is usually supplied to town customers, was considerably reduced by the several methods of manufacturing condensed milk. The reduction was greatest in the case of the manufacture of sweetened condensed milk and least in the case of the drying of milk sprayed into a current

of hot air. The drying of milk over heated revolving cylinders occupied an intermediate place.

In each of the three methods of treatment there was a stage at which the reduction in the total number of bacteria was much greater than that observed in the finished article ready for sale. The increase in the number of bacteria observed during the final state is ascribed to recontamination.

"The reduction in the total number of bacteria was almost entirely due to the death of streptococci, staphylococci, sarcinæ, bacilli of the *Bacillus coli* type, streptothrixes, yeasts, etc.

"At none of the stages of preparation was the milk ever found completely sterile. The amount of heat to which the milk was submitted was insufficient to bring about the death of several saprophytic and of some pathogenic bacteria. Among the saprophytic bacteria which were invariably found to resist pasteurization those most commonly detected were sporing bacilli of the types included under the term *B. mesentericus*. Some streptothrixes appeared in some cases to have survived, but the evidence on that point was not conclusive."

Some living tubercle bacilli of bovine origin were found to have survived treatment of drying milk over heated revolving cylinders, while the drying of milk in a current of hot air had even less effect on tubercle bacilli. These bacilli were capable of producing tuberculosis in guinea pigs, but the course of the disease was much slower than that of the disease produced in guinea pigs inoculated with the same amount of untreated tuberculous milk.

Experiments relating to the creamery and dairy, A. BURR (*Ber. Landw. Reichsanst. Intern.*, No. 35 (1914), pp. 227, figs. 7).—This reports experiments on methods of testing milk and cream, and the operation of separators and other creamery equipment.

Report [of] marketing conference held in Chicago, October 29, 1914, at [the] National Dairy Show (*Chicago: Drovers Journal Press* [1915], pp. 30, pl. 1).—The papers given at this conference, which was held in connection with the Ninth National Dairy Show, were Milk Marketing and City Distribution, by C. F. Whiting (pp. 4-8); The Marketing of Butter, by L. D. H. Weld (pp. 8-18); Ice Cream Marketing, by M. Mortensen (pp. 19-24); and The Transportation of Dairy Products, by E. M. Wentworth (pp. 24-30).

VETERINARY MEDICINE.

Farm animals in health and disease, A. MACHENS (*Die landwirtschaftlichen Haustiere in gesunden und kranken Tagen*. Ratisbon: J. Habel [1914], pp. 371, pls. 11, figs. 139).—A handbook of instruction on hygiene as related to the horse, ox, pig, sheep, goat, and farmyard fowl, the recognition of disease symptoms, first aid in sickness and accident, etc.

Collected papers of the Lister Institute of Preventive Medicine (*Lister Inst. Prev. Med., Collected Papers*, No. 10 (1913-14), pts. 1, pp. 688, pls. 16, figs. 41; 2, pp. 650, pls. 13, figs. 44).—Part one deals with bacteriological, epidemiological, pathological, and statistical papers, and part two with biochemical, physiological, and zoological papers.

The biology of the blood cells with a glossary of hematological terms, O. C. GRUNER (*Bristol, England: John Wright and Sons, Ltd., 1913*, pp. XII+392, pls. 30, figs. 37).—This work deals with the subject under the headings of the primordial blood cell, the red blood cell, the lymphocyte, the large mononuclear leucocyte, the neutrophile leucocyte, certain phlogocytes, and the cytoplasmic phenomena of blood-forming tissues. References to the literature, a glossary of hematological terms, a general index, and an index of diseases of animals, and authors are included.

Digest of comments on the Pharmacopœia of the United States of America and on the National Formulary, M. G. MOTTER and M. I. WILBERT (*Pub. Health Serv. U. S., Hyg. Lab. Bul.* 98 (1914), pp. 518).—This deals with the data acquired from the literature for the calendar year ended December 31, 1913.

Biological products (*Pub. Health Rpts. [U. S.],* 30 (1915), No. 4, pp. 256-258).—A list is given of the establishments licensed for the preparation and sale of viruses, sera, toxins, and analogous products. The products which may be sold under the law are mentioned.

The formation of antibodies in rats fed on pure vegetable proteins (Osborne-Mendel stunting food), L. HEKTOEN (*Jour. Infect. Diseases,* 15 (1914), No. 2, pp. 279-282, figs. 2).—The purpose of the study was to determine whether or not the formation of antibodies proceeds in the usual way in rats whose growth is arrested by feeding vegetable proteins but in which no disturbance of general health is observed. Two sets of experiments were carried out, each involving a group of stunted and normal rats. Similar results were obtained in each case. "It appears, then, that so far as the results of these experiments indicate, the arrest of growth in rats by the Osborne-Mendel method does not cause any disturbance in the production of antibodies."

Serodiagnosis of pregnancy, E. ABDERHALDEN and A. FODOR (*München. Med. Wchnschr.,* 61 (1914), No. 14, pp. 765-767; *abs. in Jour. Amer. Med. Assoc.,* 62 (1914), No. 20, p. 1591).—Besides the optic and dialysis methods a third method for diagnosing pregnancy has been evolved, viz, the determination of the nitrogen in the dialyzate, the results with which compare favorably with the former two methods. The ferments may be demonstrated by the refractometer, the ultramicroscope, polarization, etc., and possibly by staining.

Diagnosis of pregnancy in horses, cows, and goats by the dialysis method, F. REHBOCK (*Arch. Wiss. u. Prakt. Tierheilk.,* 40 (1914), No. 4-5, pp. 324-354).—The diagnosis of pregnancy in the horse, cow, and goat is deemed possible by the Abderhalden method (*E. S. R.,* 31, p. 278); with it pregnancy may be diagnosed 12 to 20 days after conception. When the fetus dies negative results are obtained.

The use of Abderhalden's test for diagnosing pregnancy in animals, SCHATKE (*Ztschr. Veterinärk.,* 25 (1913), No. 10, pp. 425-431; *abs. in Berlin. Tierärztl. Wchnschr.,* 30 (1914), No. 23, p. 404).—The method was tested with particular reference to its value for diagnosing pregnancy in cows. With 54 cows, all pregnant, the test showed positive every time, and with 54 non-pregnant animals it was negative. The dialysis method is said to be a reliable test, but it can only be conducted in a well-arranged laboratory.

Experience with the Abderhalden serum test for pregnancy, J. ROSENBLOOM (*Biochem. Bul.,* 3 (1914), No. 11-12, pp. 373, 374).—Uniformly successful results were obtained with the method. The author is firmly convinced of its reliability.

On the specificity of placental proteins in skin reactions of the human body, F. H. FALLS and F. K. BARTLETT (*Amer. Jour. Obstet.,* 70 (1914), No. 6, pp. 910-918; *abs. in Jour. Amer. Med. Assoc.,* 64 (1915), No. 2, p. 176).—A local reaction was obtained with placental protein (*E. S. R.,* 32, p. 579) in non-pregnant and pregnant individuals. "The difference in the reaction, however, is neither great nor constant enough to be of value in the diagnosis of pregnancy. This speaks against the theory that the pregnant woman is specifically sensitized to placental proteins. The lack of a general anaphylactic reaction also speaks against the view that the pregnant woman is in fact a sensitized woman. We realize that the method of preparation of the proteins is open to the objection that our manipulations may have so changed the substrate that the specific

ferments could no longer attack it and break it down. That may be true, and yet other proteins capable of sensitizing and producing anaphylactic shock can be handled in a similar manner and retain their specificity, as shown by Vaughn, Wells, and others."

On the protective value of aqueous extract (Hiss) of leucocytes in acute infections in animals, W. E. YOULAND, JR. (*Jour. Med. Research*, 31 (1915), No. 3, pp. 367-390).—Leucocytes probably do not contain neutralizing substances within the meaning of immunity. Leucocyte extracts apparently exert their actions upon animal infections only in the border line type of infections and are without curative value in more constant conditions. See also a note by Archibald (E. S. R., 31, p. 377).

The effect of intraspinal injections of serums with and without preservatives, J. AUER (*Jour. Amer. Med. Assoc.*, 62 (1914), No. 23, pp. 1799, 1800).—Experiments were carried out on dogs and monkeys to determine what effects are produced when an antimeningococcic serum containing 0.3 per cent of either tricresol or chloroform is injected subdurally. As control injections, horse serum, without any preservative, and Ringer solutions were employed.

It was found that dogs would tolerate up to 6 cc. and more per kilogram of body weight of 0.3 per cent tricresol without danger, as a rule, provided that an efficient artificial respiration is maintained. Monkeys would tolerate injections of more than 6 cc. per kilogram of body weight without any dangerous effect on spontaneous respiration.

"Tests with serums containing 0.3 per cent chloroform, 0.3 per cent ether, or no preservative at all, showed that they exerted qualitatively the same effects when injected intraspinally as tricresol serum, but quantitatively the disturbances of respiration and blood pressure were definitely less. Chloroform serum caused in general a smaller effect on the respiration and blood pressure than tricresol serum, but the best results were obtained with 0.3 per cent ether serum and with serum without any preservative, although both still occasionally produced in the dog stoppages of the respiration lasting a minute or two and a considerable lowering of the blood pressure. In the monkey, however, normal serum or ether and chloroform serum produced practically only negligible effects on the respiration and blood pressure. . . .

"It should be emphasized that respiratory failure is the great danger after tricresol injection in the dog, and that it occurs only rarely in the monkey."

Preliminary note on the presence of agglutinins for the *Micrococcus melitensis* in the milk and blood serum of cows in London, J. C. KENNEDY (*Jour. Roy. Army Med. Corps*, 22 (1914), No. 1, pp. 9-14, fig. 1; *abs. in Jour. Compar. Path. and Ther.*, 27 (1914), No. 2, pp. 185, 186).—Although agglutination was noted in some samples in dilutions of 1:20, there were a few reactions in dilutions of 1:300. *M. melitensis* could not be isolated from either market milk or milk obtained directly from individual cows. When diluted milk was passed through porcelain filters the property of agglutination was reduced considerably.

Revised rules and regulations for the suppression and eradication of infectious and contagious diseases affecting live stock in the State of Georgia, effective on and after December 1, 1912, P. F. BAHNSEN ([*Off. State Vet. Ga.*], *Bul. 7, Ser. A* (1912), pp. 29).—This is a compilation of the rules and regulations promulgated which became effective December 1, 1912.

Foot-and-mouth disease, F. PROESCHER (*N. Y. Med. Jour.*, 101 (1915), No. 8, pp. 351, 352, figs. 5).—The success obtained with methylenazur with certain filterable viruses suggested the application of the method to other unknown filterable viruses. Material obtained from the pustules of two typical cases of foot-and-mouth disease (in Europe) in cattle showed that with the "usual bac-

terial stains, carbolfuchsin, methylene blue, and Gram stain, only a few bacteria and cocci were seen, which are, without doubt, ordinary bacterial contamination. With methylenazur, an enormous number of extremely small cocci in the form of diplococci or diplobacilli, sometimes appearing in short chains, closely packed together, were made visible. The majority of the micro-organisms are just within the limit of microscopic visibility (0.1 micron); the largest form are about 0.2 micron. They are metachromatic violet blue; few are stained deep blue. In places where the organisms appear widely separated, they seem to be surrounded by a small colorless capsule."

The author is not prepared to say whether this organism is identical with the cocci isolated by Siegel (E. S. R., 27, p. 378).

Foot-and-mouth disease and the number of live stock (*U. S. Dept. Agr., Farmers' Bul. 651 (1915), pp. 4, 5*).—A brief statement as to the extent of the occurrence of foot-and-mouth disease in the United States during the recent outbreak. Less than 0.08 per cent of the total number of cattle in the country had been slaughtered to January 1, 1915, in stamping out the disease, and it is pointed out that "if the plague had been temporized with and had gotten beyond control, the United States would doubtless have had to endure permanently an annual loss of many millions of dollars."

Foot-and-mouth disease, A. D. MELVIN and J. R. MOHLER (*Amer. Jour. Vet. Med., 10 (1915), No. 3, pp. 162-170, 204-206; Hoard's Dairyman, 49 (1915), No. 8, pp. 295, 298-301, 304, figs. 3*).—This paper on the outbreak of foot-and-mouth disease in the United States in 1914, its history, distribution, methods of handling it, etc., was delivered before the annual meeting of the United States Livestock Sanitary Association. Up to February 9, 1915, 111,868 animals in 2,245 herds distributed over 223 counties in 20 States and the District of Columbia had been infected.

[**Foot-and-mouth disease in**] the National Dairy Show cattle, W. R. SPANN (*Jersey Bul. and Dairy World, 34 (1915), No. 14, pp. 450, 451*).—This article considers the effect of foot-and-mouth disease on the animals exhibited at the National Dairy Show, which are the only ones that have been kept in quarantine during the 1914 outbreak instead of being destroyed. Of the 719 head 712 contracted the disease, while the 7 remaining proved immune or had it so slight that it was not noticeable. The disease occurred among these animals in a mild form, none of the 712 succumbing to it, and while the udders of many of the cows were affected only 6 cows of the entire lot lost one or more quarters. About 75 per cent of the calves that were born while the cows were affected died. All the animals have been dipped and otherwise disinfected, and contact experiments with susceptible cattle and swine are being carried on to determine whether it is safe to release them from quarantine.

Tick paralysis, J. L. TODD (*Jour. Par., 1 (1914), No. 2, pp. 55-64*).—The author describes a number of cases of tick paralysis recorded by physicians in southern British Columbia. This is followed by a report of experiments carried on with the lamb, guinea pig, and puppy.

"Previous publications have proved that a paralysis in children may be associated with the bites of ticks in western North America and in Australia; that a paralysis of sheep has been associated with the bites of ticks in British Columbia and in South Africa; that the ticks associated with these affections are of more than one sort; that *Dermacentor venustus* has produced paralysis in lambs and in a puppy in experiments made under laboratory conditions; that the paralysis following tick bite is probably an individual and novel condition.

"The paralysis of children is not infrequently accompanied by elevation of temperature and by other constitutional symptoms; it is possible that symptoms resembling those observed in children sometimes may appear in adults who

have been bitten by ticks. Under experimental conditions by no means every tick bite produces paralysis in laboratory animals. A weak extract of ticks will not cause paralysis when injected into white rats, even though it possesses definite power to prevent the coagulation of blood."

Is the detection of tubercle bacilli in the blood of value in diagnosis? BAETGE (*Deut. Med. Wchnschr.*, 40 (1914), No. 12, pp. 591-593; *abs. in Berlin. Tierärztl. Wchnschr.*, 30 (1914), No. 18, p. 308).—This investigation, made on man, led to the conclusion that blood examinations made with the object of finding tubercle bacilli were of no value, even with the severe cases where the subjects died a short time thereafter.

Determination of tubercle bacilli in the urine, E. GAUTIER (*Jour. Urologie*, 5 (1914), No. 2, pp. 161-170; *abs. in Jour. Amer. Med. Assoc.*, 62 (1914), No. 14, p. 1125).—The Ziehl-Neelson technique is regarded as absolutely reliable for detecting tubercle bacilli in the urine, provided the decoloration is done with extreme care with 33 per cent nitric acid and with alcohol.

"The method requires much patience, long centrifuging with plenty of fluid, and the slides must be examined all over. If the first examination gives negative findings, the procedure must be repeated with urine voided a few hours later. If a specimen stained with methylene blue shows red corpuscles, degenerated polynuclears, but no microbes, the search for tubercle bacilli must be resumed with renewed energy."

The findings in 28 cases are briefly summarized.

The incidence and bacteriological characteristics of tuberculous infection in children, A. EASTWOOD and F. GRIFFITH (*Rpts. Local Govt. Bd. [Gt. Brit.], Pub. Health and Med. Subjs.*, n. ser., No. 88 (1914), pp. 1-104, pls. 6; *abs. in Jour. Compar. Path. and Ther.*, 27 (1914), No. 1, pp. 80-83).—The object of this work was to determine the incidence of tuberculous infection in 150 children between the ages of two and ten years dying from various causes.

The results are said to supplement those obtained by the Royal Commission on Tuberculosis (*E. S. R.*, 25, p. 884; 26, pp. 884-886). In 56 cases there was no evidence of tuberculous infection, but in the remaining 94 evidence of infection was found, and in the majority of cases the formation of visible tuberculous lesions from which the bacilli could be recovered in culture was noted. In 16 of these cases, although tuberculous lesions were present, the bacilli were apparently dead. Examples of latent tubercle bacilli in the mesenteric or bronchial lymph glands of children showing tuberculosis in some other parts of the body were noted in 22 cases. In five these were of the bovine type and they were lodged in the mesenteric glands once and in the bronchial glands four times. Bovine bacilli were noted in three cases in apparently healthy parts, once in the bronchial and twice in the mesenteric glands; and the human type of bacilli twice, in one from the cervical, bronchial, and mesenteric glands, and in the other from only the mesenteric glands. Death was due to tuberculosis in 61 cases.

In 16 cases the bacilli present in the lesions could not be classified as to type, but of the 78 cases remaining, 65 were due to the human type and in 52 of these tuberculosis was the cause of death. The bovine type was responsible for the infection of 13 cases, and death followed in nine of them.

It is pointed out that distal lesions without lesions at the portal of entry were exceedingly rare. The uncertainty of conducting feeding experiments with animals and small doses of bacilli is emphasized.

An inquiry, based on a series of autopsies, into the occurrence and distribution of tuberculous infection in children, and its relation to the bovine and the human types of tubercle bacilli respectively, A. S. GRIFFITH (*Rpts. Local Govt. Bd. [Gt. Brit.], Pub. Health and Med. Subjs.*, n. ser., No. 88 (1914),

pp. 105-166; *abs. in Jour. Compar. Path. and Ther.*, 27 (1914), No. 1, pp. 83-85).—This work, the second series of investigations, was carried out with a view to ascertaining (1) the frequency of tuberculous infection, latent or manifest, in childhood; (2) the distribution of the disease within the body; and (3) the relative incidence of the bovine and the human types of the tubercle bacillus. The tests employed to distinguish between the human and bovine types of bacilli were the cultural characters shown by growths upon glycerinized media and the virulence for certain species of animals. Attention is drawn to certain important factors in carrying out the virulence tests.

"In all, 91 strains from various sites in the bodies of 35 children were tested; of these strains 21 were obtained direct and 70 through the guinea pig. Seventy-two strains from 28 cases exhibited the cultural characters of the human tubercle bacillus, and 16 strains from 6 cases grew like bovine tubercle bacilli. In every case from which two or more strains were isolated the cultural characters of the strains were identical. In one case, a child aged five years who died from meningitis, both human and bovine bacilli were proved to have been present in the bronchial glands. The cultures in this case were obtained through guinea pigs. . . . None of the bovine strains was isolated from children over four years of age. . . .

"Bacilli of the human type were isolated from 26 diseased children and from two that were apparently healthy. In 16 of the 26 the bronchial glands were most severely affected."

Guinea pigs were inoculated with material from apparently healthy bronchial and mesenteric glands obtained from children showing no macroscopic evidence of tuberculosis and in only two cases were tubercle bacilli found. These were of the human type.

"With regard to the portal of entry the following points may be noted: Of eight cases in which the intestines or mesenteric glands were the seats of the primary lesions, six were caused by bovine bacilli and two by the human type. Of 22 cases in which the primary lesions were intrathoracic the whole were due to human tubercle bacilli. Since there is no recorded instance of a child suffering from primary thoracic tuberculosis caused by the bovine bacillus, and since there are no grounds for assuming that the two types behave differently, it must be held that the evidence tends to prove that in those cases in which primary thoracic tuberculosis caused by the human bacillus exists the path of infection has been the respiratory tract."

Analysis of the reaction to tuberculin, F. KLEMPERER (*Beitr. Klinik Tuberkulose*, 30 (1914), No. 3, pp. 433-445, figs. 24; *abs. in Jour. Amer. Med. Assoc.*, 62 (1914), No. 24, p. 1932).—It was found impossible to render nontuberculous animals susceptible to tuberculin by the preliminary injection of tuberculin. Consequently the tuberculin reaction can not be considered a phenomenon of anaphylaxis. Animals with a local tuberculous process lose their susceptibility to tuberculin for a time after the local process is excised. This apparently shows that the tuberculin reaction is not due to antibodies circulating in the blood.

Tracings and tabulated details of the experiments on rabbits and guinea pigs and some clinical data are given.

An aid to prognosis in pulmonary tuberculosis. A simple urinary test: **The urochromogen reaction** of Weisz, J. METZGER and S. H. WATSON (*Jour. Amer. Med. Assoc.*, 62 (1914), No. 24, pp. 1886-1888).—The Weisz urochromogen test was tried on 113 patients. The conclusions drawn are as follows:

"The presence of a urochromogen reaction in the urine of a patient sick with pulmonary tuberculosis is for the time being of unfavorable prognostic import. The persistent presence of a urochromogen reaction in the urine, in

spite of proper treatment, probably means a hopeless prognosis. Its absence is generally, though not invariably (regardless of how sick the patient seems), of good prognostic import. Its prompt and continued disappearance soon after treatment is instituted, in a patient who showed it before treatment, so far as our experience goes, is a favorable prognostic sign; but it will take several years' observation of these particular patients to determine this point conclusively.

"Finally, it is not an invariable guide to prognosis, but in the majority of cases is of much value, and as all prognoses must be good, bad, or doubtful, it will, if judiciously used, help materially to reduce the number in the doubtful class."

Curative tests against tuberculosis, VELASKO (*München. Tierärztl. Wchnschr.*, 65 (1914), No. 11, pp. 248, 249).—A six-year-old ox having typical clinical signs of pulmonary tuberculosis was given two injections of Burow's tuberculosan with the result that the animal in one-half year's time could have been sold to a butcher at a profit. A young cow having the clinical signs of tuberculosis and also giving a positive opthalmic reaction was treated with three doses of Klimmer's antiphymatol. Five months later all signs indicating a pathological condition had vanished.

The destruction of the vitality of *Cysticercus bovis* by freezing, B. H. RANSOM (*Jour. Par.*, 1 (1914), No. 1, pp. 5-9).—Experiments conducted by the author show that if measly beef carcasses are exposed for six days to a temperature not exceeding 15° F. the vitality of the cysticerci will be destroyed; "that some may survive in carcasses exposed for five days to this temperature, though it is doubtful whether they will retain sufficient vitality to develop in the human host; and finally that a considerable proportion may survive in carcasses exposed to a temperature of 15° for four days or less."

Under the new regulations governing the inspection of meat (E. S. R., 32, p. 777), instead of being refrigerated for three weeks as heretofore carcasses retained on account of *C. bovis*, of which there have been more than 40,000 annually, will be held for six days at a temperature not higher than 15° and then released for food. Thus the refrigeration expense will be greatly reduced since only about a third as much cold will have to be produced for each carcass and only about a third as much storage space will be required to take care of the carcasses.

References to the literature are appended.

Division of veterinary science, M. H. REYNOLDS (*Minnesota Sta. Rpt.* 1914, pp. 49-55).—The total loss in the State from hog cholera, both direct and indirect, is estimated at not less than \$5,000,000 for the year. The production of serum increased from 25,000 cc. in 1908 to 1,000,000 cc. in 1913.

An investigation of several proprietary hog-cholera cures and preventives showed that Benetol apparently has no immunizing value when given to healthy hogs exposed to infection and has no curative value when administered to hogs in different stages of the disease. When given internally by drench, unless highly diluted, it is irritating to the mucous membranes of the alimentary tract and when injected intramuscularly is followed by extensive abscess formation. In a similar series of experiments Hudson Hog Cholera Remedy gave very unsatisfactory results, and preliminary trials with Hog Cholera Specific were in no way encouraging and were discontinued entirely when analyses showed that the so-called remedy consisted of a small amount of potassium iodid.

The standardization of antihog-cholera serum, T. P. HASLAM and O. M. FRANKLIN (*Jour. Infect. Diseases*, 15 (1914), No. 2, pp. 257-267, fig. 1).—The object of this investigation was to ascertain if the various sources of error affecting the methods of standardization of antihog-cholera serum may be re-

duced or eliminated. When pigs are inoculated with increasing amounts of serum and virus, a point is reached at which the pigs no longer show more than a transient fever. This disease is regarded as the protective dose of the serum.

Desiccation appeared to have no effect upon the potency of the serum. When the red blood cells were removed from a serum it was definitely more potent than the serum containing the cells. Serum stored in aluminum vessels for 24 hours was not necessarily affected in potency.

A contribution to the shoat typhoid (Ferkeltyphus) problem, H. WEIDLICH (*Amer. Jour. Vet. Med.*, 9 (1914), Nos. 10, pp. 728-730, 761, 762; 11, pp. 796-798, 837, 838; 12, pp. 870, 871).—A translation from the German of the article previously noted (*E. S. R.*, 32, p. 83).

The present state of knowledge of swine fever with special reference to the available statistics, M. GREENWOOD, JR. (*Lister Inst. Prev. Med., Collected Papers*, No. 10, pt. 1 (1913-14), Paper 12, pp. 69+III).—A statistical study made at the request of the National Pig Breeders' Association to determine the present state of our knowledge regarding the pathological and administrative procedure relative to swine fever, with special reference to the serum treatment in England and abroad. "The report is divided into the following sections: The pathology and bacteriology of swine fever and swine plague; the history of swine fever and swine plague; the statistical history of swine fever in Great Britain; the statistical history of swine fever and swine plague on the Continent; the experimental basis of immunization; the statistical evidence relating to immunization. Certain statistical data on American field experiments are analyzed in an appendix." The principal conclusions drawn are the following:

"There is strong experimental evidence that both serum and simultaneous (serum and virus) inoculations enable treated animals to withstand infective conditions which prove fatal to the large majority of untreated animals. The duration of this power to withstand fatal infection lasts much longer in animals treated by the simultaneous method. There is *prima facie* evidence that the same conclusions hold in field practice. The statistics upon which the third conclusion rests are incomplete in various ways, and deductions made from them are subject to suspicion owing to possible fallacies or errors. There is no reliable evidence for or against the view that simultaneous inoculation, properly carried out, is liable to convey infection to healthy pigs. Dorset and his colleagues' original experiments suggest that this danger depends upon the success with which the dose of serum counterbalances the dose of virus, and that a vaccinated animal without symptoms of illness is no danger to others."

Sacks as carriers of swine fever, J. F. D. TUTT (*Vet. Jour.*, 70 (1914), No. 472, pp. 513, 514).—"The writer believes that the fact that sacks are fertile agents of propagation of the infection has long been recognized by the general practitioner, who has unfortunately only too small a share in the control of the disease."

Report on the results obtained by the special committee for investigation of infectious anemia of the horse (*Vet. Jour.*, 70 (1914), No. 474, pp. 604-627, figs. 2).—This is the report of a special committee organized by the Japanese Government in July, 1909, for the investigation of infectious anemia of the horse. The appointment was brought about through outbreaks of the disease in several important breeding districts in Hokkaido and in the northeastern part of Hondo, the main island of Japan. The investigation was continued up to March, 1914, during which time more than 1,000 animals, including 980 horses, 1 donkey, 7 calves, 5 goats, 6 sheep, 7 pigs, and a few other small animals were experimented with.

The report considers the history of the appearances and spread of the disease, its pathogenesis, modes of infection, symptomatology, course and prognosis, therapy, immunization, and preventive inoculation and disinfection. A draft of regulations for its prevention is appended. In investigating its appearance and spread among horses in Japan, it was found that very few cases developed in the stable but on pasture it easily spread with astounding rapidity, a great majority or the entire herd succumbing to it. The experiments conducted led to the conclusion that the entrance of the virus into a healthy individual through its alimentary canal can actually take place but that if it takes place in nature it must be a very slow and limited process. They demonstrate that the disease can be transmitted without intercourse between healthy and sick horses when the free access of insects is not prevented.

In pasturing experiments the disease was spread in both May and June when horseflies (*Chrysopus japonicus* and *Hæmatopota tristis*) appear and in July and August when several species of *Tabanus* occur, thus leading the committee to conclude that horseflies are the real transmitters of infectious anemia among horses in Japan. It is known that horses become immune to the disease but the results of preventive inoculation experiments thus far have been negative.

The use of artificial sera for strangles in horses, SUSTMANN (*Berlin. Tierärztl. Wchnschr.*, 30 (1914), No. 29, pp. 516, 517).—Good results were obtained in severe and atypical cases by giving subcutaneous injections of artificial sera composed of the following ingredients: (1) (Hayem's) sodium chlorid 5 gm., sodium sulphate 10 gm., boiled water to make 1,000 cc.; (2) sodium chlorid 2½ gm., sodium sulphate 5 gm., sodium nucleinate 2 gm., and boiled water to make 500 cc. Both of these solutions, which are administered at blood heat, should be tried for other diseases.

The pathology of pseudotuberculosis of rodents caused by *Bacillus pseudotuberculosis rodentium*, T. MESSERSCHMIDT and KELLER (*Ztschr. Hyg. u. Infektionskrank.*, 77 (1914), No. 2, pp. 289-303).—This work deals briefly with the morphological, cultural, and serological characteristics of *B. pseudotuberculosis rodentium*, its resistance to heat and disinfectants, pathogenicity for experimental animals, etc. Histologic studies are also reported upon.

RURAL ENGINEERING.

Irrigation development in Montana, S. T. HARDING (*Montana Sta. Bul.* 103 (1915), pp. 211-336, figs. 9).—This bulletin was prepared under a cooperative agreement between this Office and the Montana Station. It does not deal with the practice of irrigation, but gives data as to the present and prospective irrigation development of the State based on a study of the available water supply and of the lands so situated as to be capable of irrigation, which are described in eight divisions according to climatic, physical, and agricultural conditions. Considerable statistical and legal data with reference to agriculture and irrigation in the State are given and irrigation projects in the different divisions are described in detail.

It is stated that there is now leaving Montana an average of from 30,000,000 to 35,000,000 acre-feet of water per year. The direct flow without storage would supply, if fully used, about one-third this amount.

Drilling 30-inch wells for irrigation, F. W. PARK (*Irrig. Age*, 30 (1914), No. 1, pp. 393-395, 415, figs. 5).—It is the main purpose of this article to explain how these large diameter wells are sunk to receive deep-well pumps.

Solving the silt problem, L. C. HILL (*Engin. Rec.*, 70 (1914), No. 23, pp. 609, 610).—The author suggests for muddy streams in the Southwest the construction of reservoirs at the head of the irrigation canal systems to prevent the

filling up of irrigation canals and the choking of headworks. He considers the danger of the silting up of such reservoirs to be negligible.

Water for irrigation and stock, J. C. BRÜNNICH (*Queensland Agr. Jour., n. ser., 2* (1914), No. 6, pp. 406-410).—Notes are given on water in general and on the conditions under which waters are suitable for irrigation and stock watering.

Economical duty of pumps, F. H. CARTER (*Engin. Rec., 70* (1914), No. 23, pp. 618-620, figs. 4).—The author gives an analysis of the cost of pumps and pumping engines and comparisons between special tests and every-day duty. Diagrams are presented showing the estimated cost of steam pumping engines, the economic duty of pumping engines, and means of finding the comparative economy for pumping engines of different duties.

A report on the methods and cost of reclaiming the overflowed lands along the Big Black River, Mississippi, L. A. JONES, W. J. SCHLICK, and C. E. RAMSER (*U. S. Dept. Agr. Bul. 181* (1915), pp. 39, pls. 11, figs. 19).—This report is based on a survey of the overflowed lands along the Big Black River, which was finished August 15, 1913. It describes briefly the conditions found, discusses the drainage problems encountered, and presents the plan of drainage considered most practicable.

The area to be improved comprises 133,460 acres of bottom land bordered by rough rolling land and steep hills. The valley has a fall of 3 ft. per mile at the upper end of the district which gradually decreases to $1\frac{1}{2}$ ft. at the lower end. The soil of the Big Black bottoms is very uniform in texture and is composed of a silty loam underlain by clay.

From studies of run-off in watersheds similar to and in the same general locality as the Big Black watershed, the following formula of the Murphy type was deduced upon which the design of all levee improvements was based:

$$Q = \frac{18700}{M + 144} + 18$$

Q =discharge in second-feet from each square mile and M =the watershed area in square miles. For computing the size of all ditches the following formula was deduced:

$$Q = \frac{1000}{M} + 15$$

The general plan as proposed for the drainage of the Big Black River bottoms consists of the construction of a main ditch and of the necessary laterals at the upper end of the valley, the construction of levees, the clearing of a floodway through the bottoms, including the present river channel, and provision for interior drainage by the construction of ditches and the clearing of present channels.

"In computing the sizes of ditches and levees and the capacities of the floodways, the Chezy formula, $v = c\sqrt{rs}$, was used. In this formula c is . . . determined by Kutter's formula, in which the coefficient of roughness, n , was taken at 0.030 for ditches, 0.035 for cleared channels, and 0.040 for floodways. To provide a margin of safety, ditches were given a depth of 1 ft. greater than that computed as necessary to handle the discharge. The tops of the levees were taken at 3 ft. above the high-water line as computed. . . .

"To carry out this work 36 drainage districts are planned, having a total area of 96,088 acres. The estimated cost of this work, exclusive of that of clearing the main floodway, varies in the different drainage districts from \$15.72 to \$44.36 per acre, the average cost per acre for the entire 36 districts being \$23.06."

Tables of run-off data, bench-mark locations, and a number of maps of the proposed improvements are appended.

Reclamation of the swamp and overflowed lands of North Carolina, J. H. PRATT (*N. C. Geol. and Econ. Survey Press Bul. 134 (1914), pp. 6*).—In discussing drainage conditions in the State data are given showing that there are 46 districts in the swamp areas and 34 districts in the overflowed areas which will reclaim an aggregate of 942,121 acres. It is stated that thorough drainage pays and is one of the most profitable investments in the State.

Preventing erosion in Piedmont drainage districts (*N. C. Geol. and Econ. Survey Press Bul. 133 (1914), pp. 5*).—Brief instructions for preventing erosion are given.

Topographic surveys for drainage districts, J. S. BOWMAN (*Proc. Iowa Engin. Soc., 26 (1914), pp. 96-100*).—The author discusses the process of topographic surveying for drainage districts, emphasizing as essential features the completeness of data for the design and its reasonable cost.

Cost of excavating drainage ditches with steam and electric machines (*Engin. Rec., 70 (1914), No. 26, pp. 704, 705*).—Comparisons are made of drag-line and suction dredges operated on the North Side Minidoka Project of the U. S. Reclamation Service, in which work both steam and electric machines were used. "While the latter were much higher in first cost, the operating expense has been so much lower than with steam machines that this handicap has not merely been overcome, but a substantial saving recorded as against the performance of the steam machines." Detailed cost data are given.

Subsoiling demonstration with explosives, D. TURNER (*Ann. Sci. Bul. Roy. Agr. Col. Cirencester, No. 4-5 (1912-13), pp. 79-81*).—Subsoiling with explosives in a heavy calcareous loam produced no increase in the crop of potatoes the following season. This result is attributed to the wet condition of the soil during blasting and to the use of too heavy charges of explosive.

Location and construction of highways in mountain country, F. W. HARRIS (*Engin. News, 72 (1914), No. 25, pp. 1199-1201, figs. 5*).—This article deals with pioneer road construction and improvement when the problem is to get as many miles of good passable highway as possible for a fixed appropriation, with particular reference to far western conditions. The author argues against the 5 per cent maximum grade and points out many of what he considers to be its fallacies for such highways. The successful use of a drag-line scraper on such works is described.

Bituminous macadam roads in Rhode Island, I. W. PATTERSON (*Municipal Engin., 47 (1914), No. 6, pp. 437-441*).—The results obtained with a number of test sections of road laid in 1909 led to the conclusion that "upon the whole, the cold-mixing method of constructing bituminous macadam as practiced in Rhode Island appears to be an economical pavement for motor vehicle traffic. It does not appear to the writer as suitable for heavy horse-drawn traffic or for a heavy mixed traffic."

Standard small culverts recommended by the Illinois Highway Commission (*Engin. and Contract., 42 (1914), No. 25, p. 572, figs. 5*).—Drawings and tables of quantities for concrete culverts used by the Illinois State Highway Commission are given.

Steel bridge standards of the Iowa Highway Commission, E. F. KELLEY (*Engin. Rec., 70 (1914), No. 24, pp. 631, 632, figs. 5*).—The types of structure adopted by the commission are: I-beam spans with 16, 18, and 20 ft. roadways for spans from 16 to 32 ft., inclusive; pony trusses with 16 and 18 ft. roadways for spans from 35 to 100 ft., inclusive; and through trusses with 16 and 18 ft. roadways for spans from 100 to 150 ft. Expansion is provided by sliding or rocker shoes.

Experiments on road dust prevention, W. A. THAIN (*Ann. Sci. Bul. Roy. Agr. Col. Cirencester, No. 4-5 (1912-13), pp. 102-104*).—Tests of granular cal-

cium chlorid led to the conclusion that it appears to be a particularly suitable, effective, and cheap dust preventive for estate and farm roads.

Ontario highway laws (*Toronto: Comr. Highways, 1914, pp. 147*).—The text of these laws is given.

Notes on the tests of some large reinforced concrete pipe, W. J. SCHLICK (*Iowa Engineer, 15 (1914), No. 3, pp. 103-110, figs. 5*).—Tests of the supporting strength of a number of reinforced concrete bell and spigot tile in 8-ft. lengths and with diameters of from 18 in. to 48 in. are reported. The reinforcing in the 36-in. and 48-in. pipe was of $\frac{3}{8}$ -in. bars spaced 3 in. and $3\frac{1}{2}$ in., respectively, with $\frac{3}{8}$ -in. longitudinal bars to which the circular rings were wired. Triangular mesh reinforcing was used for the other three sizes, No. 4 mesh being used for the 18-in. pipe and No. 23 mesh for the 24-in. and 30-in. sizes.

In the bar reinforced pipes cracking, especially on the sides, was confined to a few main cracks, while in the mesh reinforced pipes the cracking in the sides was much more distributed and regular. In all cases cracking in the top and bottom was confined to a fewer number of cracks than in the sides, and there was apparently no fixed relation between the load at which cracking begins and the maximum load. "All difference in the character and number of cracks, seems to be traceable to the amount, kind, and location of the reinforcing." Corrugated reinforcing was no more effective than smooth reinforcing. The elongation of the horizontal diameter of the pipe at the critical load averaged from 0.05 to 0.75 in. "For lateral extension of 0.01 in. to 0.05 in. the ditch filling would not be sufficiently compressed to give any lateral support. . . . It seems evident that some method of anchoring the reinforcing at the top and bottom would have made the steel more effective. The development of the principal side cracks so near to the point where the reinforcing crosses the neutral axis indicates that the reinforcing would have been more efficient had it been so located as to cross the neutral axis of the pipe wall at the 45-degree point. Although no definite turning point was evident during the tests, the data show that the safe load for these pipes was somewhat less than one-half the maximum load."

Farm surveying, R. H. SMITH (*Farm Engin., 2 (1914), No. 5, pp. 83-85, figs. 5*).—This article describes and illustrates the process of leveling with homemade instruments.

Alcohol as fuel, B. O. JENKINS (*Sci. Amer., 111 (1914), No. 25, p. 509*).—In summarizing the relative positions of the possible sources of cheap industrial alcohol, particularly for use in farm gas engines, it is stated that colonial-grown maize stands first in importance, followed by wood sawdust. "With the present information available, neither potatoes, beets, nor peat appear as favorable as is generally supposed."

Electricity in rural districts, J. L. WHITE (*Jour. Electricity, 34 (1915), No. 1, pp. 10, 11*).—This article gives suggestions as to the means whereby central stations can increase the use of electric current in rural districts.

Small motor applications for farm work, C. J. ROHRER (*Trans. Amer. Soc. Agr. Engin., 7 (1913), pp. 151-176, figs. 15*).—The author deals with the use of electricity on the farm. He points out that electricity is being used for over 125 different farm operations, of which there are 50 in the farm home, 20 in the dairy, and 30 for farm and field machinery.

It is stated that 1 cent's worth of electricity at 10 cts. per kilowatt-hour will operate a 6-lb. flatiron for fifteen minutes, drive an electric vacuum cleaner long enough to clean 450 sq. ft. of carpet, lift 100 gal. of water 100 ft., keep a heating pad hot for from two to three hours, or run a sewing machine two hours, a 12-in. electric fan two hours, or a buffer and grinder $1\frac{1}{4}$ hours.

Tests made on an eight-machine milking equipment driven by a 3-horsepower motor indicate that the power cost is about 2 mills per cow with electricity at 10 cts. per kilowatt-hour. The average load on the motor was 2.3 horsepower and the vacuum maintained by the pump was 15 in. A test of a feed grinder running at 650 revolutions per minute and driven by a 5-horsepower motor showed the power consumption when grinding corn to be 0.433 kilowatt-hour per bushel. Tests on another grinder driven by a 15-horsepower motor showed a current consumption of 0.411 kilowatt-hour per bushel.

Results secured with a small thresher having a 28-in. cylinder and a 42-in. separator and driven by a 15-horsepower electric motor showed that the power consumption incident to threshing a ton of oat straw averaged about 2.62, of barley 2.36, and of wheat 2.27 kilowatt-hours. The power consumption per bushel of oats averaged 0.07, of barley 0.108, and of wheat 0.16 kilowatt-hour.

The sizes of motors suggested to be used for different farm operations are given in the following table:

Sizes of motors to use on different machines.

Machine.	Horsepower of motor.			Machine.	Horsepower of motor.		
	Mini-mum.	Maxi-mum.	Size most commonly used.		Mini-mum.	Maxi-mum.	Size most commonly used.
Household machines:				Farm machines—Contd.			
Sewing machine.....			$\frac{3}{8}$	Threshers, 32-in. cylinder.....	30	50	40
Buffer and grinder.....	$\frac{1}{8}$	$\frac{3}{8}$	Both.	Corn shellers, single hole.....	$\frac{3}{8}$	$1\frac{1}{2}$	1
Vacuum cleaner.....	$\frac{1}{8}$	5	$\frac{1}{8}$	Power shellers.....	10	15	15
Ice-cream freezer.....	$\frac{1}{8}$	2	$\frac{1}{8}$	Fanning mills.....			$\frac{1}{4}$
Washing machine.....	$\frac{1}{8}$	2	$\frac{1}{8}$	Grain graders.....			$\frac{1}{4}$
Meat grinder.....	$\frac{1}{8}$	$\frac{3}{8}$	$\frac{1}{8}$	Grain elevators.....	$1\frac{1}{2}$	5	3
Water pump.....	$\frac{1}{8}$	1	$\frac{1}{8}$	Concrete mixers.....	2	10	5
Dairy machines:				Groomer, vacuum system.....	1	3	2
Water pump.....	$\frac{1}{8}$	5	3	Groomer, revolving system.....	1	2	1
Cream separator.....	$\frac{1}{8}$	$\frac{1}{8}$	$\frac{1}{8}$	Hay holts.....	3	15	5
Churn.....	$\frac{1}{8}$	3	$\frac{1}{8}$	Root cutters.....	1	5	2
Milking machine, vacuum system.....	1	3	3	Cordwood saws.....	3	10	5
Refrigeration.....	$\frac{1}{2}$	10	5	Wood splitters.....	1	4	2
Farm machines:				Hay balers.....	3	10	$7\frac{1}{2}$
Feed grinders (small).....	3	10	5	Oat crushers.....	2	10	5
Feed grinders (large).....	10	30	15				
Silage cutters.....	10	25	15-20				
Shredders and huskers.....	10	20	15				
Threshers, 19-in. cylinder.....	12	18	15				

Farm experience with the tractor, A. P. YERKES and H. H. MOWBY (*U. S. Dept. Agr. Bul. 174 (1915), pp. 44*).—This bulletin reports data based on the experience of a large number of both successful and unsuccessful users of tractors west of the Mississippi River, as well as replies to a circular sent out to bankers in that section.

Attention is called to the fact that the data represent a record of a machine in the process of development and not of a completed and perfected outfit. "Most of these tractors have been operated by men who were not properly trained and equipped to handle them efficiently, and during the first few years of the development of the gas tractor the machines placed on the market were mainly large outfits, which were necessarily expensive, and failure meant a heavy financial loss.

"It is generally recognized that the gas tractor was of great value in rapidly breaking up large areas of prairie sod in the West at a time when horses were

not available, but after the sod was broken they proved an unprofitable investment for the individual farmer in a large percentage of cases. A few owners have found the tractor a very profitable investment, doing its work more satisfactorily and much cheaper than could be done with horses, while a great many discontinued its use after a trial. The percentage of owners reporting favorably regarding the tractor decreases with the length of time they have used their outfit, due partly to the fact that the older machines were not as good as the later ones, but mainly to a better realization of the tractor's value in their work. . . . Owners who report unfavorably regarding the tractor obtain poorer average results than those who state that the tractor is a good investment. . . .

"The average life of a tractor as estimated by owners in North Dakota is about six years, while the average life as estimated by owners in States other than North Dakota is about eight years. To judge by the small percentage of reports received for tractors three or more years old, it would appear that a large number of outfits three, four, and five years old are no longer in use, indicating that the average life is even less than six years. The plowing done with tractors has been little, if any, deeper than that done with horses. Combination work is not practiced to a great extent, and usually is limited to harrows or drags after the gang plow. The percentage of tractors which are operated at night is comparatively small, varying from 11 to 14 per cent, although the tractor's efficiency at night is very good. No injurious packing of the soil is caused by the tractor's wheels if the soil is in proper condition to be worked. The item of repairs has been one of considerable importance in connection with the use of farm tractors, but the data indicate that a large percentage of such repairs have been caused by inefficient operation.

"The necessity for the operator of a gas tractor being thoroughly trained for his work, if a tractor is to prove a success, is obvious. . . .

"The tractors which have been operated by kerosene show, as a whole, slightly better average results than those operated by gasoline, indicating that the heavier fuels can be burned at least as satisfactorily as the lighter ones. The amount of kerosene used per unit of work, however, is usually slightly more than for gasoline, which would appear to indicate that the combustion of the kerosene is generally not as perfect as that of the gasoline. This is partly due to the fact that many owners are burning kerosene in tractors equipped with ordinary gasoline carburetors. . . .

"The data apparently show that the tractors with drawbar ratings of 15 horsepower are giving slightly better results than either the larger or smaller sizes. The tractor has not, as a rule, displaced its equivalent in work horses as regards either power or value. Its purchase, therefore, usually increased the investment in power, as well as in certain kinds of equipment. The necessity for a large acreage, if the invested capital per acre is to be kept within a safe limit, is very apparent, although in many farming communities a tractor may prove profitable on a small acreage, provided the owner can obtain some lucrative custom work for the tractor when it is not required on the home farm. . . . The modern gas tractor of 10 or more horsepower has thus far, within its limited area of use, proved to be an auxiliary of the farm horse rather than a substitute. . . .

"Up to the present time the tractor appears to have made for itself no important place in the agricultural economy of this country. In a few limited localities in the West where conditions especially favor its use large tractors are used by some men with apparent profit. The general situation, however, indicates that the large tractor is not to be a factor in increasing farming by extensive methods and on a large scale, for a few years at least. Instead

there are indications that the tractor of the future must make possible more intensive agriculture on farms of moderate size, though the large outfits will probably continue to be used on some of the exceptionally large farms in the West. It is worthy of note that some of the successful users of tractors were able to reduce the number of their farm horses. This fact suggests that there may be a field for farm reorganization to make possible the economical utilization of the tractor."

An efficient alfalfa ditcher, L. M. LAMPSON and B. HUNTER (*Washington Sta. Popular Bul. 81* (1915), pp. 4, figs. 3).—A ditcher for cleaning out the furrows in furrow-irrigated alfalfa is described and illustrated. It consists essentially of a single-shovel plow and a slide drag attached to a wooden tongue. The plow pulls against a 10-in. coil spring on the end of its beam. It is claimed that with this device the furrow can be cleaned out to within 7 ft. of the head ditch on account of the doubletree being hitched behind the plow instead of to the end of the plow beam. It is also claimed that the draft of this ditcher is approximately one-third less than that of the ordinary ditcher and that the weight of the driver upon the slide is sufficient to hold the plow in position.

The trade in agricultural machines in France, G. COUPAN (*Vie. Agr. et Rurale, 3* (1914), No. 18, pp. 469, 470, fig. 1; *abs. in Internat. Inst. Agr. [Rome], Mo. Bul. Agr. Intel. and Plant Diseases, 5* (1914), No. 6, pp. 805, 806, fig. 1).—The greatest quantity of agricultural machines and implements imported into France is said to have come from the United States, namely, 55 per cent in 1895 and 69 per cent in 1912. The next most important country in this connection is the United Kingdom, followed by Germany. Mowers, reapers, and binders are the most extensively imported. French machines are exported chiefly to the French colonies and protectorates.

How to erect small concrete farm buildings (*Cement Era, 12* (1914), No. 12, pp. 40, 41, figs. 3).—Methods of the construction of small concrete farm buildings without the aid of mechanics are briefly described.

The wooden hoop silo, W. D. ZINN (*West Virginia Sta. Circ. 8* (1914), pp. 4, figs. 2).—A brief description of the construction of the wooden hoop silo is given.

The shower-bath system of sheep dipping (*Impl. and Mach. Rev., 39* (1914), No. 468, p. 1660; *abs. in Internat. Inst. Agr. [Rome], Mo. Bul. Agr. Intel. and Plant Diseases, 5* (1914), No. 6, pp. 809, 810, fig. 1).—This system is described and illustrated. It consists of a shed 40 ft. long by 12 ft. wide, the roof of which is of flat perforated iron sheets. The dip is pumped by a 3-in. centrifugal pump from a tank to the roof and falls through the perforations onto the 200 sheep beneath, the shower lasting about seven minutes. This method, it is stated, is proving entirely satisfactory, enabling four men to dip 1,000 sheep per hour.

A house for sixty hens, W. E. FRUDDEN (*Amer. Thresherman, 17* (1914), No. 8, pp. 74, 75, figs. 3).—A house for sixty hens built on the open but closable front plan is described and diagrammatically illustrated.

Air-cooled apple storage houses, W. N. HUTT (*North Carolina Sta. Bul. 228* (1914), pp. 3-31, figs. 23).—It is the purpose of this publication to point out the essential features in the construction of air-cooled apple storage houses and to illustrate both in plan and section typical storage houses which exemplify approved methods of construction and of ventilation.

It is stated that the efficiency of any form of fruit storage house depends on the insulating of a chamber with walls of such material and of sufficient thickness that the temperature within will be affected as little as possible by fluctuations of temperature without. Cement concrete is considered to be one of the best materials for the construction of storage houses. It is further pointed out that in the construction of inexpensive but efficient orchard storage

houses it is important to take advantage of the insulating qualities of earth and dead air.

Apertures for ventilation and the intake of cool air are considered necessary for air-cooled storage houses, but windows and doors should be reduced to the smallest possible number and size consistent with convenience. It is stated that the exposed side of the house should face the north, where it avoids the direct sun in the daytime and draws in the coldest air at night.

Hygro-thermographic records taken in a storage house of approved construction showed that in comparison with an outside variation of 37° in temperature the storage chamber showed a total variation of only 11° . Similar records taken in another house showed the same uniformity in temperature, which is considered essential to the success of the storage.

As regards the management of an air-cooled apple storage house, it is stated that in preparation for the crop advantage should be taken of every cool night to lower the temperature of the storage chamber as much as possible. The ventilators should be opened after sundown and the whole house closed tightly before sunup, so as to keep out the warm air. The fruit should be allowed first to cool overnight and then be placed in the storage before sunup. As the weather becomes cooler advantage should be taken of it to lower the temperature and cool down the fruit as much as possible. When all the fruit is in, the house should be opened as little as possible and the fruit left wholly undisturbed.

It is stated that the general consensus of opinion among practical cold-storage men indicates that apples should be stored at a temperature of 30 to 40° F. and pears 33 to 36° .

[Construction of creameries and cheese factories], E. H. FARRINGTON and G. H. BENKENDORF (*Wisconsin Sta. Bul. 244 (1915), pp. 20-52, figs. 16*).—This deals with the location and general features in the construction and arrangement of creameries and cheese factories and illustrates and discusses six different creamery plans which are considered to exemplify good practice. An inspection score card is included.

The disposal of creamery sewage, E. H. FARRINGTON and G. J. DAVIS, JR. (*Wisconsin Sta. Bul. 245 (1915), pp. 20, figs. 9*).—It is the purpose of this bulletin to describe and illustrate suitable arrangements for the purification and disposal of creamery sewage.

It is stated that creamery sewage is not so quickly purified as city sewage owing to the fact that the curd, oil, and sour milk decompose slowly and the lactic acid from sour milk has a tendency to suppress the growth of purifying bacteria and thus retard the liquefaction and gasification of the solid matter. For this reason where a sedimentation tank is used the waste acid from testing milk and cream should not be allowed to run into the drain. Clean water used for cooling purposes should also be excluded.

The septic tank, it is stated, should be large enough to hold at least three days' sewage. "The flow may be estimated (1) by assuming that the amount of sewage from a creamery will be from 1 to $1\frac{1}{2}$ gal. for every pound of butter made, or (2) by calculating the amount of water pumped per day or by measuring the capacity of the supply tank and deducting from the total water pumped the amount used for cooling purposes and not allowed to run into the floor drain."

Some of the special features to be observed in the construction of a septic tank suitable for the digestion of creamery sewage are given as follows: "The cover should be provided with a manhole so that occasionally the sludge at the bottom of the tank may be removed. A grease trap may be placed in the drain between the factory and the tank for the purpose of collecting machine oil and

large lumps of suspended curd. . . . The inlet to the tank should consist of a 6-in. pipe ending in a tee supported by 1½-in. gas pipes set in the concrete wall of the tank so that the inlet will be submerged. A wooden baffle placed across the end of the tank and extending about 2 ft. below the surface of the sewage will distribute the flow across the tank and will reduce to a minimum the disturbance due to the entering water. At the outlet end of the tank the discharge takes place in a thin sheet flowing over a weir, which may be made of angle iron set on the top of the concrete wall. . . . A wooden baffle similar to the one at the inlet end should be placed about 6 in. from the weir wall to prevent the scum from passing over or clogging the weir. Preferably the tank should be divided into two or three compartments by baffle walls perforated with a number of holes, so arranged as to distribute the flow uniformly throughout the cross section of the tank."

Openings are provided in the baffle walls by placing a number of drain tiles through the forms. "To prevent scum from going through, the upper row of openings should be 18 in. below the surface and to be above the level of the sludge the lower row should be about 2 ft. above the bottom. The walls should have an opening under them near the center for the purpose of flushing the sludge to the sludge drain."

The depth of the tank, it is stated, should be great enough to provide for a considerable depth of scum and sludge and still leave room for the passage of the wastes at a very slow rate, which will require a depth of from 4 to 7 ft. below the level of the water surface. The dimensions of the tank should be so proportioned as to make the length two to three times the width.

A filter bed should be provided for final treatment of the sewage after it comes from the tank. The depth of filter should not be less than 30 in. and preferably from 36 to 48 in., and the area should be such that the rate of application of the settled wastes will not exceed 25,000 gal. per acre in twenty-four hours. A dosing chamber fitted with an automatic siphon for intermittent discharge is considered an essential part of the septic tank.

A two-story sedimentation tank of the Imhoff type in which the solid matter in the sewage drops through slots in the floor of the sedimentation chamber into the lower compartment is described and illustrated as being a suitable device for the digestion of creamery sewage.

For the suppression of odors from the filters the addition of chlorid of lime to the tank effluent about an hour before it is discharged from the dosing chamber is recommended. The necessary amount will vary with the seasons, but it is stated that from 1 to 5 lbs. of chlorid of lime to 1,000 gal. of tank effluent will ordinarily be sufficient.

Design of two residential sewage treatment plants, including settling tanks of Imhoff type, S. A. GREELEY (*Engin. and Contract.*, 42 (1914), No. 25, pp. 565-567, figs. 5).—One of these plants, designed for twenty-five people, consists of a settling tank, covered sprinkling filter, and a small secondary settling basin. A tipping bucket drops the dose onto a splash plate, thence to the filter. The second plant consists of a settling tank and a subsurface irrigation system in sandy soil.

RURAL ECONOMICS.

[Needs of American farm women] (*U. S. Dept. Agr. Rpts.*, 1915, Nos. 103, pp. 100; 104, pp. 100; 105, pp. 88; 106, pp. 100).—These four reports consist mainly of extracts from about 2,000 letters received from farm women in response to an inquiry from the Secretary of Agriculture as to how this department could better meet the needs of the farm housewives.

Report 103 relates to the social and labor needs of farm women. The extracts point out some causes of dissatisfaction and contentment among farm women, the function of women's clubs, social centers, amusement, recreation, and the church in improving social conditions, the long hours and overwork, the difficulty in getting domestic help, and cooperative plans for meeting the farm woman's household needs. The abstracts also indicate the effect of the various means of communication upon rural life.

Report 104 includes abstracts relating to the plan, equipment, and management of the farm homes. The principal items mentioned are the house, the garden, labor-saving devices, heating, lighting, sanitation, clothing, preparing and preserving of food, insect pests, and woman's part in the dairy and poultry industries.

Report 105 relates to the educational needs of farm women. They consider that the education of their children can be improved through better schools, cheaper books, transportation of school children, less child labor on the farm, courses in agriculture and domestic science, and boys' and girls' clubs. The farm housewives consider that their condition could be improved through home demonstration agents, libraries and reading courses, meetings and lectures, farm women's institutes, mothers' clubs, school centers, and through special publications and bulletins relating to the problems of the farm women.

Report 106 relates to the economic needs of farm women and points out man's social and labor duty to the women on the farm, the desire for financial recognition of woman's work, and suggests gainful handicrafts and home industries for farm women. Extracts of a more general nature are included relating to farm loans, rural credit, farm prices, marketing, and methods of distribution.

There is an appendix attached to each of the above reports, giving general suggestions for the development of farm women, and indicating how farm women may obtain help under the Smith-Lever Extension Act, and through other branches of the Government. An extensive list of government publications of interest to farm women is included.

Economic history of the United States, E. L. BOGART (*New York: Longmans, Green & Co., 1914, 2. ed., pp. XV+597, pls. 7, figs. 115*).—This book outlines the economic development of the United States, devoting a large part of its discussions to agriculture. It also contains an extensive bibliography.

York State rural problems, II, L. H. BAILEY (*Albany: J. B. Lyon Co., 1915, pp. VI+7-262*).—This book, supplementing that previously noted (*E. S. R., 30, p. 491*), is made up of 25 lectures or summaries of lectures, delivered by the author at different places and on different topics, but all dealing with rural problems.

[**Problems of production in agriculture**], A. D. HALL (*Nature [London], 94 (1914), No. 2345, pp. 156-162; 94 (1915), No. 2361, pp. 601-607*).—The author outlines various means whereby the world's food supply may be augmented, among them increasing the cultivated area, conserving the water supply as by dry-land farming, irrigation, draining and improving moor land, properly applying fertilizers, increasing the efficiency of agricultural workers, and arranging for the successful employment of research workers.

Ownership, tenure, and taxation of land, T. P. WHITTAKER (*London: Mac-Millan & Co., Ltd., 1914, pp. XXX+574, fig. 1*).—This book treats of all land whether used for agricultural or nonagricultural purposes. It traces the origin of private ownership of land, the establishment of inclosures, and the leasehold systems, and shows some of the relationships between agricultural wages and the problems of land tenure and of housing in country and town.

Land revenue, administration, and tenures in British India, F. NOYCE (*Internat. Inst. Agr. [Rome], Mo. Bul. Econ. and Soc. Intel., 5 (1914), Nos. 11,*

pp. 125-140; 12, pp. 85-98).—This article outlines for British India the tenure of land relative to the States, the relations of the tenants to the landlords, and the administration of the land revenue, by showing its historical development from a system of paying taxes by taking a portion of the cultivator's grain heap to an actual cash payment based upon an estimated value of the land. The article also describes the method of surveying the land and determining its value.

Cooperation in agriculture, marketing, and rural credit, C. B. AUSTIN and G. S. WEHRWEIN (*Bul. Univ. Tex.*, No. 355 (1914), pp. 100).—This bulletin cites a number of typical instances of cooperation among farmers which illustrates the causes of both failure and success. It describes briefly a number of typical farm organizations and how to form cooperative credit unions under the Texas law.

Rural credits, M. T. HERRICK and R. INGALLS (*New York: D. Appleton & Co.*, 1914, pp. XIX+519).—The authors have given a historical description of the various types of agricultural credit found in the different countries of the world. In addition, there are chapters on credit, its forms and use, special privilege and state aid, long-term loans and amortization, debentures, principles of land credit and their application, cooperation and cooperative credit, and the principles of cooperative credit and their application.

How farmers may improve their personal credit, C. W. THOMPSON (*U. S. Dept. Agr., Farmers' Bul.* 654 (1915), pp. 14).—In this publication have been considered two general methods whereby farmers may improve their personal credit: That of temporary agreements with existing loan agencies, the agreements terminating with the payment of the loans, and that of permanent articles of agreement among the farmers themselves, or "cooperative credit associations." Three different plans are presented by which the farmers may improve their personal credit with local banks.

Under plan 1, farmers enter into an agreement with local bankers or with other persons who supply the loans to adopt a uniform and approved system of dairy improvement. Those furnishing the funds buy dairy stock, which is sold to the farmers at actual cost plus a certain percentage to cover incidental expenses. The lender takes in payment the farmer's personal note, with or without indorsement, or with mortgage security on the stock purchased. Under plan 2, some additional security is supplied by having the farmers collectively assume a guaranty for the notes given by the members under an agreement. Under plan 3, in place of the limited guaranty supplied by the farmers themselves jointly, as described under plan No. 2, a similar guaranty from a third party is substituted, consisting of local business men who realize their common interest with the farmers in the general improvement of the agricultural conditions in their territory. These men subscribe a certain percentage of the funds loaned, with the understanding that the money is to be a guaranty fund to protect the bankers.

A cooperative credit association has the collective security available under plan 2, and is available continuously for such purposes as may be approved by the association. This publication outlines how such associations are organized and managed and help their members in making the loans productive.

Cotton crop mortgage credit, R. L. BENNETT (*Agr. and Mech. Col. Tex. Ext. Bul. E. S. 4*, pp. 16).—This bulletin outlines a system for conducting a 40-acre farm on the all-cotton basis and on the basis of food, feed, and cotton. The author advocates the changing of the system of farming to one based on food and feed for the farm and all the cotton the individual farmer can then grow.

Farm credit in Wisconsin, B. H. HIBBARD and F. ROBOTKA (*Wisconsin Sta. Bul.* 247 (1915), pp. 66, figs. 12).—This report is based upon a field study of

agricultural credit in Dane and Rusk counties and a part of Douglas County, Wis. The county records of mortgages, statements of local trust and loan companies, bankers, merchants, and farmers were used principally as a source of information.

The report indicates that it was more difficult to obtain loans and that the interest rate was higher in the northern counties than in Dane County, that the mortgaged farms are smaller than the unmortgaged farms but have more live stock and more invested in buildings, and that the average mortgage runs for about five years. Rusk County mortgages are smaller, relatively more numerous, and pay interest at a higher rate than those in Dane County.

The local men furnish nearly three-fourths of the money for Dane County farm loans. Of the Dane County mortgages, 81 per cent are for the purchase of land as compared with 68 per cent of those in Rusk and Douglas counties. Chattel mortgages are more numerous in Rusk and Douglas counties than in Dane County.

It is estimated that store credit interest is 15 per cent per annum and the average account runs for four months.

The report concludes that personal credit is more imperatively needed than land credit, and that this need is more acute in the northern than in the southern counties. A law providing for farmers' credit unions is also needed. Amortization schedules and tables, prepared by E. B. Skinner, are also included.

The Jewish Agricultural and Industrial Aid Society (*Jewish Agr. and Indus. Aid Soc. Ann. Rpt. 1914*, pp. 67).—This report continues that previously noted (E. S. R., 30, p. 693).

Among the data shown are that 41 per cent of the loans granted during the year were to purchase equipment, 26 per cent to pay off mortgages or other debts, 18 per cent to construct or to repair buildings, 12 per cent to purchase farms, and 3 per cent to increase the working capital. The report also indicated that 29 per cent of the loans were to farmers who had been on their farms less than one year and 20 per cent to those who had been on their farms from one to two years.

[Societies for agricultural production and distribution] (*Bd. Trade [Gt. Brit.], Abs. Labor Statis. United Kingdom, 17 (1915), pp. 247-254*).—These pages contain statistical tables showing for the societies organized for the production and distribution of agricultural products in the United Kingdom the number of organizations, membership, capital, and business conducted from 1898 to 1912.

[The organization of creameries and cheese factories], E. H. FARRINGTON and G. H. BENKENDORF (*Wisconsin Sta. Bul. 244 (1915), pp. 3-20*).—The authors believe that to insure success there should be at least 400 cows for a creamery and 200 cows for a cheese factory. They point out the distinction between proprietary and cooperative factories and joint stock companies and cooperative associations. There is outlined a method of organizing, articles of incorporation, suggested by-laws, and a scheme for financing the work.

Farm records and accounts, E. L. CURRIER (*Montana Sta. Circ. 43 (1915), pp. 87-109, figs. 2*).—The author outlines what he considers the salient features of farm records and how they should be kept. He believes that the farmers should make a daily work record, keep account of all cash transactions, and make an annual farm inventory. He submits model forms and points out some of the most common difficulties in farm accounting and how they may be overcome.

The agricultural outlook (*U. S. Dept. Agr., Farmers' Bul. 651 (1915), pp. 1-4, 5-29*).—This number gives the estimated number of live stock on January 1,

1915, and indicates that their number for every class has increased during the last year, although the number of cattle, hogs, and sheep marketed at seven of the largest markets shows a decrease.

A prediction by G. A. Bell is given that the big demand for horses will probably occur after peace has been declared. At present the demand is primarily for mediocre animals, but when the war is over the demand will be for high-class animals for use as well as for breeding purposes.

It is estimated that the stock of potatoes on hand January 1, 1915, was 166,846,000 bu., which is a quantity larger than that reported during the last six years. The increased acreage of fall-sown wheat and oats in the cotton States amounted to 3,700,000 acres, or ten per cent of the total cotton acreage.

Apple cold storage holdings are discussed by C. W. Moomaw. Data are given as to the production of upland long-staple cotton. Statistical tables are shown giving estimated total value of 13 crops for 1914, the number of live stock, their total value and value per head and prices of farm products by States on January 1, 1915, with comparative data for earlier years.

Thirty-second annual report of the chamber of commerce, Minneapolis, Minnesota, 1914 (*Ann. Rpt. Chamber Com. Minneapolis*, 32 (1914), pp. 204).—This report shows for Minneapolis, by statistical tables, the monthly and yearly receipts, shipments, and closing prices for grain, flax, mill products, and hay. It also shows comparative data for other cities, together with their elevator and milling capacity and visible supply.

Report of the Board of Grain Commissioners for Canada (*Rpt. Bd. Grain Comrs. Canada*, 1914, pp. 160).—This report discusses the work of the Commission during the year under the topics of inspection and weighing department, the public, and country, lake terminal, interior, and "hospital" elevators, and points out the various difficulties encountered and suggestions for improvement.

Monographs relating to conditions in rural parishes of Portugal (*Bol. Dir. Geral Agr. [Portugal]*, 11 (1912), Nos. 2, pp. 135, figs. 20; 5, pp. 72; 6, pp. 118, figs. 26; 7, pp. 61, figs. 2; 8, pp. 98, figs. 13).—These monographs contain an extensive description of the topography, climate, rural and urban population, agriculture, industries, and commerce of a number of rural parishes of Portugal.

[Agriculture in Egypt] (*Ann. Statis. Egypte*, 5 (1913), pp. 407-437).—This portion of the annual statistics shows the number of proprietors possessing farms of specified areas and the area in the principal crops and devoted to different agricultural purposes for 1912-13, with comparative data for earlier years. The data are shown for Egypt as a whole and for the major subdivisions.

[Agriculture in Madagascar] (*Ann. Gén. Madagascar et Dépend.*, 1914, pp. 591-608).—These pages give information concerning the development of the crops, forests, and live stock in Madagascar, and describe the problems of their production and distribution.

[Agriculture in Java and Madura] (*Jaarc. Konink. Nederlanden, Koloniën*, 1912, pp. 60-70).—This portion of the annual report gives the total area in cultivation and the production of the principal crops. The data are given by nativity of the operator and for a series of years.

[Agriculture in Japan] (*Japan Year Book*, 1914, pp. 337-357).—These pages of the yearbook contain detailed statements regarding arable land, farming population, tenant farmers, farm products, live stock, and special crops. The text is amplified by a large number of statistical tables.

[Expenditure for living in urban and country districts in Australia], G. H. KNIBBS (*Commonwealth Bur. Census and Statis. Aust., Labor and Indus. Branch Rpt.* 4 (1913), pp. 32-34).—Although the cost of living was practically the same

in both districts, the amounts spent under the different items varied widely. For the urban districts 17.17 per cent of the total was spent for housing, 38.02 for food, 12.90 for clothing, 4.49 for fuel and light, and 27.42 for other items. The distribution for country districts was 8.50, 43.51, 14.32, 4.59, and 29.08 per cent, respectively.

AGRICULTURAL EDUCATION.

Progress of agricultural education in 1912-13, F. B. JENKS and C. H. LANE (*Rpt. Comr. Education [U. S.] 1913, I, pp. 211-233*).—This is a review for 1912-13 of the leading features of progress in agricultural education in this country and abroad, including the principal items of interest concerning the agricultural colleges and normal, secondary, and elementary schools in the United States in which agriculture is taught, educational work of the Graduate School of Agriculture, the U. S. Department of Agriculture, the Association of American Agricultural Colleges and Experiment Stations, the American Association for the Advancement of Agricultural Teaching, the Department of Superintendence of the National Education Association, the Conference for Education in the South, and of other conventions, and the principal developments in agricultural education in other lands.

[Contributions to the history of the New York State College of Agriculture] (*Cornell Countryman, 12 (1914), No. 3, pp. 167-258, figs. 40*).—This number contains the following historical articles: The Relation of Ezra Cornell to the College of Agriculture, by A. D. White; Pioneer Days in Agriculture, by I. P. Roberts; The Later Financial and Physical Development of the College of Agriculture, by L. H. Bailey; The New York State College of Agriculture in Its Relation to Agricultural Progress in the United States, by A. C. True; The Development of the Faculty, by A. J. Lamoureux; The Development of the Experiment Station, by J. H. Comstock; The Development of the Courses of Instruction, by G. N. Lauman; Development of the Graduate Work, by W. A. Riley; The Development of the Land and the College Farms, by J. L. Stone; The Extension Work at the College, C. H. Tuck; Home Economics in the College of Agriculture, by Martha Van Rensselaer; Reminiscences of Early Cornell Days, by W. R. Lazenby; and Some Cornell Boys I have Known, by B. T. Galloway.

Record of the alumni of the Kansas State Agricultural College (*Manhattan: Kans. State Agr. Col., 1914, pp. 308, figs. 28*).—In addition to the alumni record a history is given of the administrations of five of the presidents of the college and of the present one to date, the courses of study, changes in college life, and attendance.

A preliminary outline of the courses of study in agriculture and minimum of required equipment for the farm-life schools of North Carolina, E. A. HODSON (*Raleigh, N. C.: State Supt. Pub. Instr., 1914, pp. 18*).—This bulletin also contains suggested additional equipment, text and reference books, and lists of publication for the library.

Division of agricultural extension, A. D. WILSON (*Minnesota Sta. Rpt., 1914, pp. 59-68*).—This is the annual progress report on the work of the division of agricultural extension, comprising farmers' institutes and clubs, special trains, rural school work, county agricultural agents, short courses, demonstration farms, county fairs, special meetings, publications, aid to cow-testing and live-stock shipping associations, and the production of the "Back to the Farm" play.

The Oka Agricultural Institute, J. M. LIGUORI (*Agr. Gaz. Canada, 1 (1914), No. 11, pp. 907-912, figs. 6*).—A description is given of the equipment, courses of study, and staff of the Oka Agricultural Institute at La Trappe, Quebec. This

institute, which is nearly 30 years old, has been recently converted into a scientific agricultural institute, affiliated with Laval University, and now grants the B. S. A. degree. It possesses nearly 2,000 acres of land, half of which is untilled.

Report of the schools' division of the experimental union, S. B. MCCREADY (*Ann. Rpt. Ontario Agr. and Expt. Union, 35 (1913), pp. 53-58*).—The director of elementary agricultural education of Ontario reviews the origin and aims of the schools' division, discusses its relation to the rural problem and the weakness of the rural schools, and gives an account of the 1913 distribution of plant material to about 400 schools.

School gardens (*Agr. Gaz. Canada, 1 (1914), No. 10, pp. 823-832, figs. 4*).—Brief accounts are given of the present status of school garden instruction in the Provinces of Nova Scotia, New Brunswick, Quebec, Ontario, Saskatchewan, and Alberta.

The third continuation course in forestry at Heidelberg (*Forstw. Centbl., n. ser., 36 (1914), Nos. 8-9, pp. 468-478; 10, pp. 520-530*).—A detailed description of the course is given.

The General Education Board, 1902-1914 (*New York: Gen. Ed. Bd., 1915, pp. XV+240, pls. 32, figs. 31*).—This is an account of the activities of the General Education Board from its foundation in 1902 to June 30, 1914, including farm demonstrations and boys' and girls' agricultural clubs.

Agricultural teaching (*U. S. Bur. Ed. Bul. 601 (1914), pp. 87*).—This bulletin contains the papers presented at the fourth annual meeting of the American Association for the Advancement of Agricultural Teaching in 1913, and for the most part previously noted (*E. S. R., 30, p. 98*) or abstracted elsewhere in this issue. Appendixes contain data on summer practicum work at the Northwest School of Agriculture, Crookston, Minn., the use of land by high schools teaching agriculture, the cooperative use of equipment and illustrative material in teaching agriculture, and incomes of pupils from farm work during attendance at school in 1913 in Massachusetts.

Use of land by high schools teaching agriculture, R. W. STIMSON (*U. S. Bur. Ed. Bul. 601 (1914), pp. 50-62*).—This paper is a part of the report for 1913 of the committee on the use of land in connection with agricultural teaching of the American Association for the Advancement of Agricultural Teaching.

Replies to a questionnaire sent to high-school teachers of agriculture indicate that in 1913 63 high schools in 35 States reported the use of land at their schools, chiefly for demonstration purposes. The size of experimental or demonstration plats varied from one one-hundred-and-twentieth of an acre to 10 acres. Fifty high schools reported agricultural production on home farm land or on other land apart from the school premises, with more or less attention paid by the agricultural instructors to the home enterprises of their pupils. Replies from individual schools are given, illustrating the differences of opinion as to what should be the scale of operations on school land and what may be done with land by high schools, and illustrating the correlation of class-room instruction with home work and systematic supervision. In conclusion the committee strongly favors the utmost utilization of the home land of the pupils, the closest possible correlation of agricultural class-room instruction with home farm activities, and suitable provision for systematic and efficient supervision throughout the producing season.

The use of land in connection with agricultural teaching in elementary schools, L. S. IVINS (*U. S. Bur. Ed. Bul. 601 (1914), pp. 62-76*).—This paper, also a part of the committee report referred to above, is based on replies to a questionnaire. The author gives replies describing the work in the 33 States, the District of Columbia, and Porto Rico, reporting the use of land at or near

one or more of their schools, at the home of the pupil, or in connection with regular school work. It is recommended that there be better supervision over home plat work, that land used at or near the school be for demonstration purposes rather than for experiments, that in training teachers of agriculture or school gardening more attention be given to instruction in the use of land, that simple records of work be kept where land is cultivated, and that if land is used by schools having all the grades, the pupils of the upper grammar grades cooperate with the high school pupils in the elementary demonstration projects. Home gardens and vacant lot gardens are deemed more popular than school gardens if they are under similar management and supervision.

Agricultural education for teachers, G. A. BRICKER (*New York, Cincinnati, and Chicago: American Book Co., 1914, pp. 172, pls. 4*).—This book, which may be considered a handbook for the teacher and a guidebook for the district and the county supervisor and the supervisor of rural or agricultural education, discusses the rise of popular education in agriculture, the problem of intensive agriculture, a popular scientific agriculture, the qualifications and preparation of the teacher of agriculture, agencies for the preparation of teachers, elementary agriculture and nature study, what is elementary agriculture, agriculture as a means of education, pedagogical problems involved in the teaching of elementary agriculture, the administration and teaching of school agriculture, cooperative use of apparatus, equipment, and illustrative material, agricultural demonstration field and home projects, and boys' and girls' agricultural clubs.

Courses in agriculture for the secondary schools of Texas, W. F. DOUGHTY, M. L. HAYES, and W. S. TAYLOR (*Joint Bul. State Dept. Ed., Univ. Texas, and Agr. and Mech. Col. Tex., No. 1 (1914), pp. 166*).—In this bulletin the authors offer general recommendations and suggestions on the qualifications of teachers, equipment and state aid, adaptation of courses in agriculture to local conditions as regards scope of courses for schools offering, respectively, one, two, three, and four years' work in agriculture, and agricultural curricula for high schools; on textbooks, notebooks, collections, exhibits, etc., visits and field trips, project work, school-farm and community and extension work; and outlines of syllabi in plant propagation, vegetable gardening, animal husbandry, dairying, poultry raising, soils and soil fertility, field crops, fruit production, farm mechanics, farm management and home grounds, landscape gardening, entomology, and weeds, together with practice work and reference material. A list of the minimum laboratory and agricultural equipment for 12 students is given, and an appendix contains score cards for field crops, farm animals, dairies, butter, and farms.

Course of study in agriculture and domestic science for rural schools (*Bul. Nebr. School Agr., Curtis, 1. ser., No. 4 (1914), pp. 32*).—This bulletin offers suggestions to teachers as to seed corn, milk testing, a comparative type study of beef and dairy cows, and cooking and sewing.

[**Agricultural and home economics instruction in the public schools of New Hampshire**], G. H. WHITCHER (*N. H. Dept. Pub. Instr., Inst. Circ. 1913-14, Nos. 5, pp. 8; 10, pp. 8; 14, pp. 22; 16, pp. 7; 17, pp. 14; 18, pp. 10; 19, pp. 8; 1914-15, Nos. 1, pp. 7; 5, pp. 14; 6, pp. 6; 7, pp. 13*).—These circulars include a discussion of cooking as a means and end in education, and instruction outlines in stock feeding, home-mixed fertilizers, school and home gardening for grade pupils, garden projects in high schools, insects that destroy farm crops, ten serious plant diseases, domestic arts and household appliances, horticulture in the high school, fruit-tree raising, and field work in soil study.

Helps for domestic science work in seventh and eighth grades, November-December (*Dept. Pub. Instr. [Ind.], Ed. Pubs., Bul. 13 (1914), pp. 22*).—This

bulletin contains definite lessons in cooking and the study of foods and in sewing and the study of clothing for each week in November and December.

Fundamentals of physics, chemistry, and bacteriology in agriculture, F. W. MILLER (*Columbus, Ohio: Dept. Pub. Instr., 1914, pp. 48, figs. 17*).—In this elementary work the author aims to develop and describe the most essential principles of these sciences as preliminary to a course in agriculture, especially in the high school.

Principles and practice of plant propagation, W. L. HOWARD (*Columbia, Mo.: Univ. Mo., 1914, pp. 92*).—These discussions and lessons are given in the classes in plant propagation in the University of Missouri and have been developed gradually since 1902. The lectures are intended to cover 15 or 16 1-hour periods or 1-2 year and the laboratory exercises one 2-hour period weekly for 15 or 16 weeks, or one semester.

Program of County Organization Day for boys' corn club, L. N. DUNCAN and I. B. KERLIN (*Alabama Col. Sta. Circ. 30 (1914), pp. 119-122*).—This is an outline of a program for the observation of Organization Day and of a suggested constitution, by-laws, and rules for a county corn club.

Elementary flora of the Northwest, T. C. FRYE and G. B. RIGG (*New York: American Book Co., 1914, pp. 256*).—This book was written for the schools of the Northwest and geographically covers Oregon, Idaho, Washington, and the coastal region of southwestern British Columbia. Most of the distinguishing characteristics of the plants are given in the keys, which are complete so far as they go, thus enabling teachers to hand out for analysis plants they do not themselves know.

The story of a kernel of corn, A. W. NOLAN (*Nature-Study Rev., 10 (1914), No. 8, pp. 307-314, figs. 6*).—The life history of a kernel of corn is described.

An industrial study of cotton in the eighth grade, B. GIST (*Atlantic Ed. Jour., 10 (1914), No. 4, pp. 13-15*).—The author presents statistics of cotton production and consumption by countries, references to literature on cotton, teacher's outlines, arithmetical and other problems on cotton, and correlated spelling.

Seed collections, ANNA B. COMSTOCK (*Nature-Study Rev., 10 (1914), No. 8, pp. 292-294, fig. 1*).—An outline is given for the study of weed seeds.

Rope and its uses, A. A. BURGER (*Iowa State Col. Agr. Ext. Bul. 24 (1914), pp. 48, figs. 196*).—This bulletin contains general information on rope and its care and directions for making knots, hitches, splices, halters, and tackles.

Preparation of teachers for nature-study and civic biology, C. F. HODGE (*Nature-Study Rev., 10 (1914), No. 8, pp. 294-307*).—The author points out the necessity of the adequate reorganization and equipment of normal schools with laboratory, greenhouse, and garden facilities, and of helping teachers already in the work through educational journals, state nature-study and biology leaflets, and practical and inspiring lectures in institutes and summer schools. "Nature-study and civic biology should be the corner stone of national vigor and health conservation."

Birds and nature-study, G. H. TRAFTON (*Bloomington, Ill.: J. G. Coulter [1914], pp. 16*).—This pamphlet for the use of teachers gives a list of references to literature helpful in bird study and suggests work for the children in the schoolroom and out of doors, field work for both the teacher and children, type studies of birds in primary, intermediate, and grammar grades, and an outline and problems for bird study arranged by grades and seasons.

Directions for field studies in agricultural nature-study, G. H. TRAFTON (*Mankato, Minn.: State Normal School [1914], pp. 16*).—Directions for field studies of birds, flowers, gardening, insects, pond life, shrubs, spiders, soils, trees, vines, and weeds are given, together with topics for fall collections.

Suggestions for winter nature-study, HELEN M. REYNOLDS and G. H. TRAF-
TON (*Mankato, Minn.: State Normal School* [1914], pp. 8).—This contains
suggestive outlines for holiday, home, health, and weather studies, types of
lessons on insect homes, an outline of a plan for teaching, with the dog as sub-
ject, and references to nature literature and songs.

Indian school gardens in eastern Oklahoma, J. B. BROWN (*Red Man*, 6
(1914), No. 10, pp. 434-437).—The author gives an account of Indian school
gardening work in Oklahoma and suggests important elements entering into
successful school gardening.

School gardening in Portland, Oregon, ALICE V. JOYCE (*Nature-Study Rev.*,
10 (1914), No. 7, pp. 275-281, figs. 2).—The author gives an account of the
establishment and activities of school gardens in Portland, Oreg., and calls
attention to some valuable results from the gardens.

MISCELLANEOUS.

Twenty-second Annual Report of Minnesota Station, 1914 (*Minnesota Sta.*
Rpt. 1914, pp. 72).—This contains the organization list, a financial statement
for the federal funds for the fiscal year ended June 30, 1914, and for the state
funds for the fiscal year ended July 31, 1914, and a report of the director sum-
marizing the work of the station and its substations. The experimental work
recorded is for the most part abstracted elsewhere in this issue.

Twenty-seventh Annual Report of New York Cornell Station, 1914 (*New*
York Cornell Sta. Rpt. 1914, pp. CLXXXII+1161, pls. 43, figs. 315, map 1).—
This contains the organization list, reports of the director of the station and
heads of departments, a financial statement as to the federal funds for the
fiscal year ended June 30, 1914, and as to the state funds for the fiscal year
ended September 30, 1914, and reprints of Bulletins 336-350, Memoirs 3 and 4,
and Circulars 21-26, previously noted, and Bulletins 351 and 352 abstracted
elsewhere in this issue.

Report of Oregon Station, 1913-14, J. WITHYCOMBE (*Oregon Sta. Rpt.*
1913-14, pp. 30).—This contains the organization list and a report of the director
on the work of the station during the biennium, including synopses of depart-
mental reports, and notes on the substations. The experimental work recorded
is for the most part abstracted elsewhere in this issue.

Report of the Eastern Oregon Branch Experiment Station, 1913-14, R.
WITHYCOMBE (*Oregon Sta., Rpt. East. Oreg. Sta.,* 1913-14, pp. 15, figs. 11).—An
account of the history, development, and present facilities of the substation at
Union, Oreg., with a discussion of its object and importance.

Annual report of the director of the experiment station on work done
under the local experiment law in 1914, J. F. DUGGAR (*Alabama Col. Sta.*
Circ. 31 (1915), pp. 31).—This includes a report by the director on the progress
of the work under this law (E. S. R., 24, p. 400), a financial statement for the
year, and reports from heads of departments, including detailed reports of boys'
and girls' club work.

List of bulletins (*West Virginia Sta. Circ.* 10 (1914), pp. 4).—A list of the
station bulletins, inspection bulletins, and circulars, and of the extension bulle-
tins, available for distribution.

NOTES

Georgia Station.—A horse and mule barn of concrete construction, 80 by 59 feet, has been completed.

Iowa College.—A special convocation was held May 14 in honor of those members of the faculty who had been in service for at least a quarter of a century. The guests of honor were Vice-president E. W. Stanton, in service since 1874, Gen. J. R. Lincoln, commandant, Herman Knapp, secretary, both in service since 1883, A. A. Bennett, professor emeritus of chemistry, in service since 1885, and Dr. L. H. Pammel, professor of botany and botanist, in service since 1889.

Kansas College.—A new state law effective July 1 provides for the formation of county farm bureaus for the employment of a county agent and other demonstration work. A bureau must enroll 25 per cent of the bona fide farmers of the county under a constitution approved by the college and must raise at least \$800 for equipment. Bureaus complying with these provisions may receive from \$800 to \$1,600 per annum from state and federal funds toward the salary of a county agent and a like sum from the county funds for salary and expenses.

Adjoining counties in the western part of the State may organize joint bureaus under substantially the same conditions, and bureaus already organized which comply with the requirements and provide the necessary equipment may be utilized. The county agents are to be selected by the executive board of the bureau and must have had at least 5 years' experience in practical farm work. All expenditures are to be made subject to the approval of the extension department of the college.

A three-day meeting for the Pottawatomie Indians at their reservation in Jackson County was held by the extension staff April 26-28.

Nevada University and Station.—Some interesting results have recently been obtained in the studies of certain biological questions connected with the life history of *Heterodera radiculicola*, the potato eelworm. It is hoped that from these a new method may be suggested for controlling this pest.

The extension division is to revive the publication of *Better Farming*, formerly issued by the station as a means of bringing it into contact with the farmer. Many requests for the continuance of the publication have been received and the station will have access to its columns much as in the past.

Oregon College.—G. V. Copson, now specializing in dairy bacteriology in the University of Berne, has been appointed instructor in pathological and dairy bacteriology.

Wisconsin University.—Ray H. Roberts has been appointed instructor in extension work in horticulture.

Wyoming University and Station.—Henry G. Knight, dean of the college of agriculture and director of the station, Dr. O. L. Prien, veterinarian, and J. E. McWilliams, acting animal husbandman, have been granted a year's leave of absence beginning September 1, to be spent in study at the University of Illinois, Northwestern University, and the Michigan Agricultural College, respectively. President C. A. Duniway will act as director of the station during this period.

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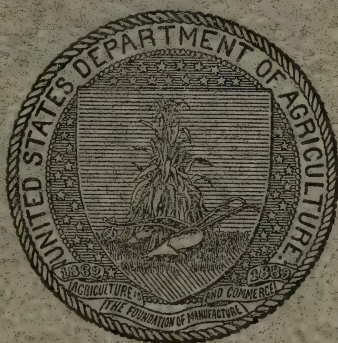
A. C. TRUE, DIRECTOR

Vol. XXXII

JANUARY, 1915

No. 1

EXPERIMENT STATION RECORD



WASHINGTON
GOVERNMENT PRINTING OFFICE

1915

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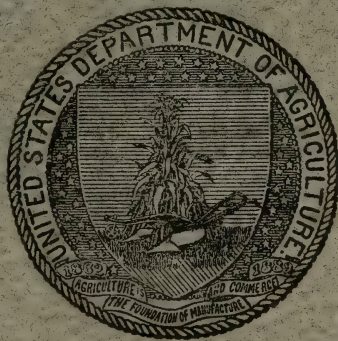
U. S. DEPARTMENT OF AGRICULTURE
OFFICE OF EXPERIMENT STATIONS
A. C. TRUE, DIRECTOR

Vol. XXXII

FEBRUARY, 1915

No. 2

EXPERIMENT STATION RECORD



WASHINGTON
GOVERNMENT PRINTING OFFICE
1915

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Issued March 10, 1915.

U. S. DEPARTMENT OF AGRICULTURE

OFFICE OF EXPERIMENT STATIONS

A. C. TRUE, DIRECTOR

Vol. XXXII

ABSTRACT NUMBER

No. 3

EXPERIMENT STATION RECORD



WASHINGTON
GOVERNMENT PRINTING OFFICE
1915

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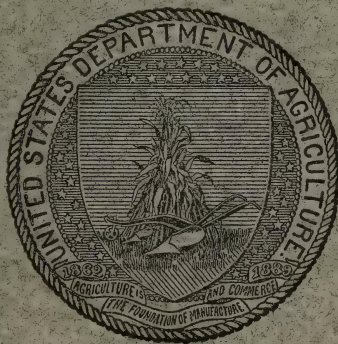
A. C. TRUE, DIRECTOR

Vol. XXXII

MARCH, 1915

No. 4

EXPERIMENT STATION RECORD



WASHINGTON
GOVERNMENT PRINTING OFFICE
1915

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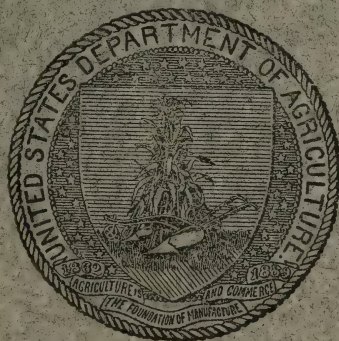
U. S. DEPARTMENT OF AGRICULTURE
OFFICE OF EXPERIMENT STATIONS
A. C. TRUE, DIRECTOR

Vol. XXXII

APRIL, 1915

No. 5

EXPERIMENT STATION RECORD



WASHINGTON
GOVERNMENT PRINTING OFFICE
1915

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Issued May 8, 1915.

U. S. DEPARTMENT OF AGRICULTURE

OFFICE OF EXPERIMENT STATIONS

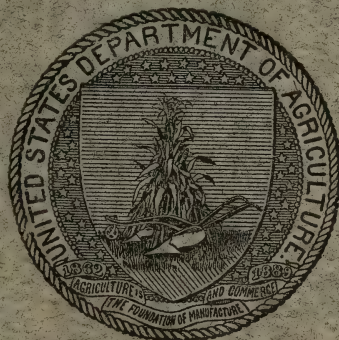
A. C. TRUE, DIRECTOR

Vol. XXXII

ABSTRACT NUMBER

No. 6

EXPERIMENT STATION RECORD



WASHINGTON
GOVERNMENT PRINTING OFFICE
1915

U. S. DEPARTMENT OF AGRICULTURE.

Scientific Bureaus.

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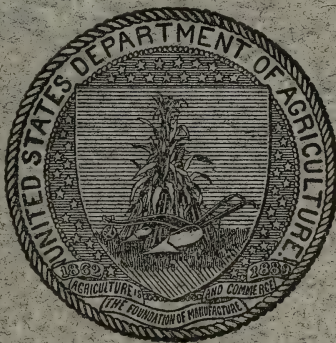
U. S. DEPARTMENT OF AGRICULTURE
OFFICE OF EXPERIMENT STATIONS
A. C. TRUE, DIRECTOR

Vol. XXXII

MAY, 1915

No. 7

EXPERIMENT STATION RECORD



WASHINGTON
GOVERNMENT PRINTING OFFICE
1915

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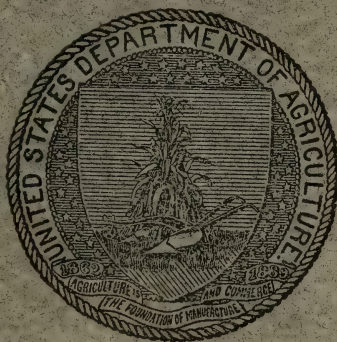
U. S. DEPARTMENT OF AGRICULTURE
OFFICE OF EXPERIMENT STATIONS
A. C. TRUE, DIRECTOR

Vol. XXXII

JUNE, 1915

No. 8

EXPERIMENT STATION RECORD



WASHINGTON
GOVERNMENT PRINTING OFFICE
1915

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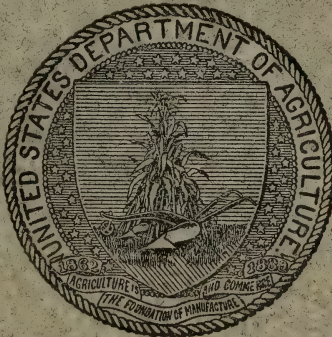
A. C. TRUE, DIRECTOR

Vol. XXXII

ABSTRACT NUMBER

No. 9

EXPERIMENT STATION RECORD



WASHINGTON
GOVERNMENT PRINTING OFFICE
1915

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U. S. DEPARTMENT OF AGRICULTURE

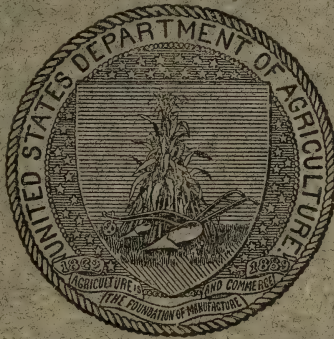
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Vol. XXXII

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